PHILIPS

Television IF-Modulator
PM 5590

9449 055 900..1

9499 490 04611

1/870/2/03....07

MP MASTER
MA24521

Television IF-Modulator
PM 5590

9449 055 900..1

9499 490 04611

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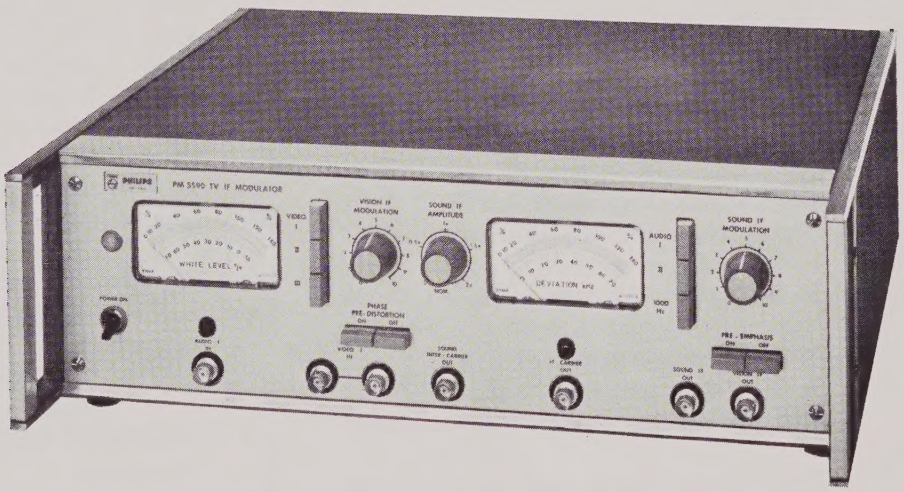

operating and service manual

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Correspondence

In correspondence concerning this instrument, please quote the type number and serial number as given on the identification plate at the rear of the instrument.

1 Introduction

The PHILIPS PM 5590 is a solid state television IF-modulator supplying a modulated crystal controlled vision IF of 38.9 or 39.5 MHz and a modulated crystal controlled sound IF of 33.4 - 33.5 or 34.4 MHz.
The instrument is fitted with modulation meters for video as well as sound. The video is amplitude modulated, the sound frequency modulated.

The output is a vestigial side band signal with phase correction and switchable phase pre-distortion. The instrument specifications are in full conformity with those of the black/white and colour transmitters. The output signal can be applied to one or more VHF or UHF converters type PM 5591 to PM 5595, to obtain carrier frequencies in any of TV bands I, III, IV or V. The main application of the PM 5590 is to supply modulated IF signals form a central point to converters located at the measuring spots.

II Technical data

Properties expressed in numerical values with tolerances stated, are guaranteed by us. Numerical values without tolerances stated, represent the properties of an average instrument and merely serve as a guide.

A. System

Vision carrier to sound carrier spacing	4.5 MHz (A-version) 6.0 MHz (B-version) 5.5 MHz (E-version)
Nominal video bandwidth	4.2 MHz (A-version) 5.5 MHz (B-version) 5.0 MHz (E-version)
Nominal width of vestigial side band	0.75 MHz (A- and E-version) 1.25 MHz (B-version)
Type and polarity of vision modulation	AM, negative*
Type of sound modulation	FM

B. Sound part

a. Input sensitivity	77.5 mV (—20 dBm)
Max. input voltage	approx.1 V
Input impedance	> 500 kΩ at 1000 Hz
b. Internal audio	
Frequency	1000 Hz ± 0.2%
Distortion	<0.1%
Amplitude stability	< ± 1%
c. Modulation meter	
Reading	peak to peak
Scale calibration	modulation depth 0–140%
A-version:	sweep (Δf) 0–35 kHz (100% = 25 kHz)
B- and E-version:	sweep (Δf) 0–70 kHz (100% = 50 kHz)
d. Intercarrier Frequency	4.500 MHz (A-version) 6.000 MHz (B-version) 5.500 MHz (E-version)
Frequency accuracy and long-term stability	< ± 10^{-4}
e. Modulation distortion (at Δ f = 100%)	< 1%
f. Frequency response	30 Hz–15 kHz, ± 0.5 dB
Switchable pre-emphasis	75 µs (A-version) 50 µs (B- and E-version)

* White level produces lowest modulation depth.

C. Vision part

a. Video input voltage	0.5–2.0 V_{p-p}, white pos. sync. neg.
Imput impedance	high, can be looped through
Reflection of looped-through input	<-30 dB, 50 Hz–6 MHz
b. Black level	
1. If a video signal is applied	DC clamping at back porch of line sync. pulse No influence on or from colour burst
2. If no video signal is applied	Black level is kept constant
Sag per line	< 1%
c. Modulation meter	
Reading	peak-white level Upper frequency limit approx. 1 MHz Not influenced by colour signals.
Scale calibration	0–140% of nominal modulation depth and 0–70% of white level (100% = 10% rest carrier)
d. Video intermediate Frequency**	38.900 MHz (A- and E-version) 39.500 MHz (B-version)

** An external IF of the specified frequency can be applied, sec. section "Modifications"

Frequency drift from 10°C–40°C	$< \pm 5 \times 10^{-6}$
Stability	$< \pm 5 \times 10^{-6}$/90 days
e. Unbalance of video modulator 10 minutes after switching on	< 1%

D. Overall figures for response and distortion

a. Amplitude response	vestigial side band characteristic (see Fig. II-1)
Suppression of IF + colour-subcarrier	> 40 dB
b. Group delay reponse**	with or without phase predistortion (see Fig. II-1)
c. Non-linear distortion, differential gain	< 2%
differential phase (measured between 10% and 80% of carrier level)	< 1°

E. Output signals

a. BU4: Modulated sound intercarrier amplitude	0–200 mV (dependent on position of R2) into 75 Ω
nominal value	100 mV (R2 in pos. "NOM")
b. BU6: Modulated sound IF-carrier amplitude	0–150 mV (dependent on position of R2) into 75 Ω
nominal value	70 mV
c. BU5: Unmodulated IF-carrier amplitude	200 mV into 75 Ω
d. BU7: Modulated vision carrier amplitude	200 mV* into 75 Ω
e. BU11 and BU12: Composite IF signal vision carrier	1000 mV* into 50 Ω
sound carrier	320 mV into 50 Ω, continuously adjustable between 0 and 650 mV
Ampl. ratio sound to vision carrier in position "NOM"	1:10
output impedance	50 Ω
SWR	< 1.1

F. Power supply

Voltage	115 V ± 20% or 230 V ± 20% to be selected by a 2 position switch
Mains frequency	50 or 60 Hz
Consumption	35 W at 220 V
Fuse	for 90–160 V: 800 mA, delayed action for 180–320 V: 400 mA, delayed action

G. Temperature

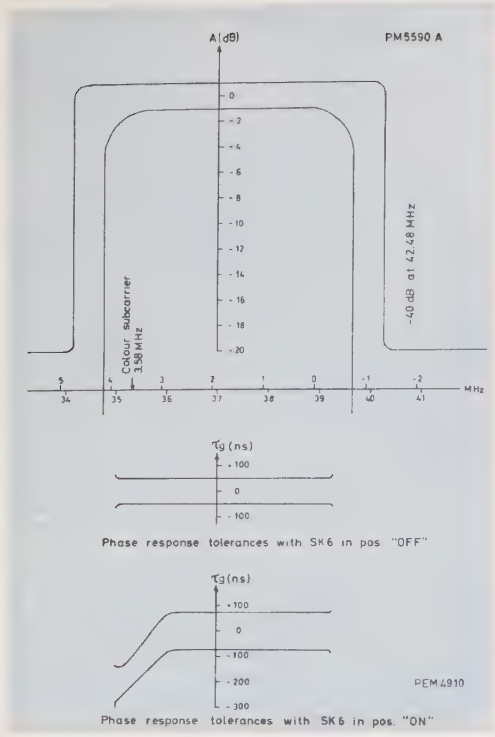
range	Operating conditions +10° to +40°C

H. Mechanical specifications

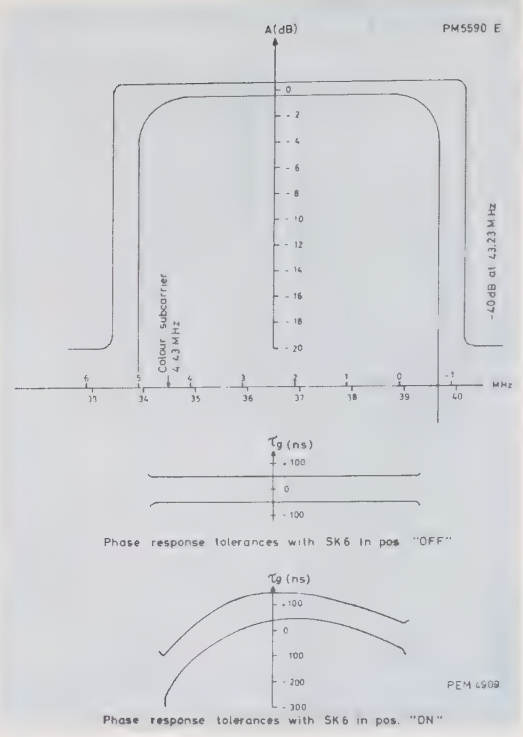
Width	19"
Height	3 units = 150 mm, incl. feets
Depth	420 mm, including handles
Weight	13 kg

The instrument is delivered as a table model, but can be easily converted into a 19" rack model.

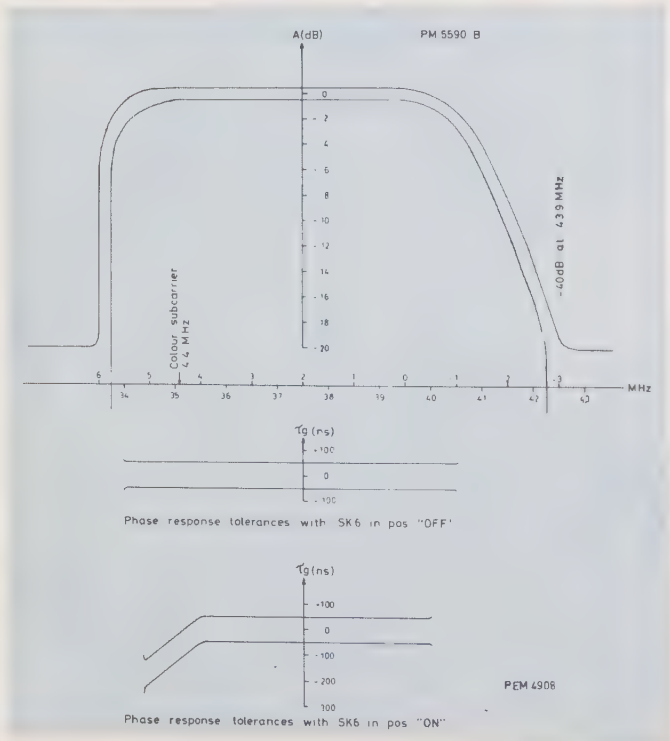
* RMS value of carrier during peaks of modulation envelope.
** Modifications are possible to a certain degree, max. slope 200 π s/MHz



a. A-version



c E-version



b. B-version

Fig. II-1 Amplitude and phase response tolerances

III Accessories

With the instrument are delivered:

- 1 operating and service manual
- 6 BNC-connectors UG 88/U
- 2 BNC-terminations 75 Ω
- 1 N-connector 50 Ω, UG 21E/U (for cable RG 8U and RG 213U)
- 1 N-connector 50 Ω, UG 536B/U (for cable RG 58C/U)
- 1 mains flex
- 1 extension board (in the instrument) enabling measurements on printed wiring board during operation

IV Block diagram

For A- and B-versions some frequencies differ, (see Fig. IV-1)

Functionally the IF modulator can be divided into a sound modulator and a video modulator, both controlled by the same 38.9 MHz oscillator. The produced signals are combined in an output amplifier.

1. The sound modulator

Switch SK4 enables to modulate the sound carrier with externally applied LF signals or with the 1000 Hz signal of an internal oscillator (U3). The signal from SK4 is via a pre-amplifier (U3) applied to a peak-level meter circuit (U4), as well as to a frequency modulator for the 5.5 MHz signal (U8). The frequency of the 5.5 MHz oscillator is controlled by a crystal oscillator with a frequency of 5.570 MHz (U8). The signal of this oscillator is mixed with the amplified 5.5 MHz signal. A resulting signal of 70 kHz is filtered in a 70 kHz-amplifier (U8) and applied to a discriminator (U8). The d.c. output voltage of this discriminator controls the 5.5 MHz oscillator. The modulated 5.5 MHz signal and the signal of the 38.9 MHz crystal oscillator are mixed in a 38.9 MHz sound modulator. A resulting frequency of 33.4 MHz is obtained through a 33.4 MHz bandpass filter (U12). This signal is applied to the sound split amplifiers (U12) and via these amplifiers to the output amplifiers (U13).

2. The video modulator

Switch SK2 enables to modulate the vision carrier with externally applied video signals.
To avoid the burst signal of a possible colour signal being influenced by the clamping, the video signal is divided into two parts.
One part is, via an amplifier with 1 MHz low pass filter (U5), applied to a clamping circuit (U6) where clamping on the back porch of the line synchronising signal takes place. This signal is fed to the video adder circuit (U6), to where the other part of the video signal is directly applied as well. For the clamped video signal the video adder circuit acts as a 1 kHz low-pass filter, while for the directly applied video signal this circuit acts as a 1 kHz high-pass filter (see Fig. IV-2).
The clamping pulses (delayed line synchronising pulses) are obtained by a synchronising pulse separator (U5) and a delay circuit (U5).
From the adder circuit, the video signal is applied to a modulation meter circuit (U6) as well as to the 38.9 MHz vision modulator, which is also supplied with a 38.9 MHz signal.
In equalizer II (U10) the modulated 38.9 MHz signal is corrected for the phase-distortion introduced by the vestigial side-band filter. By means of SK6 equalizer I (U9) can be introduced, whereby the phase response is further pre-distorted (see Fig. II-1).
The vestigial side-band filter cuts off the higher frequencies of the upper side-band. Then the signal is via a split amplifier (U12) applied to the output amplifiers (U13).

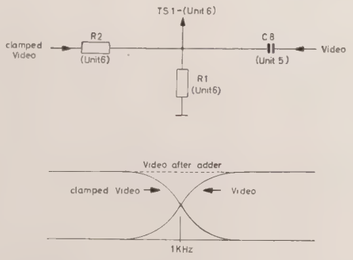


Fig. IV-2 Video adder circuit

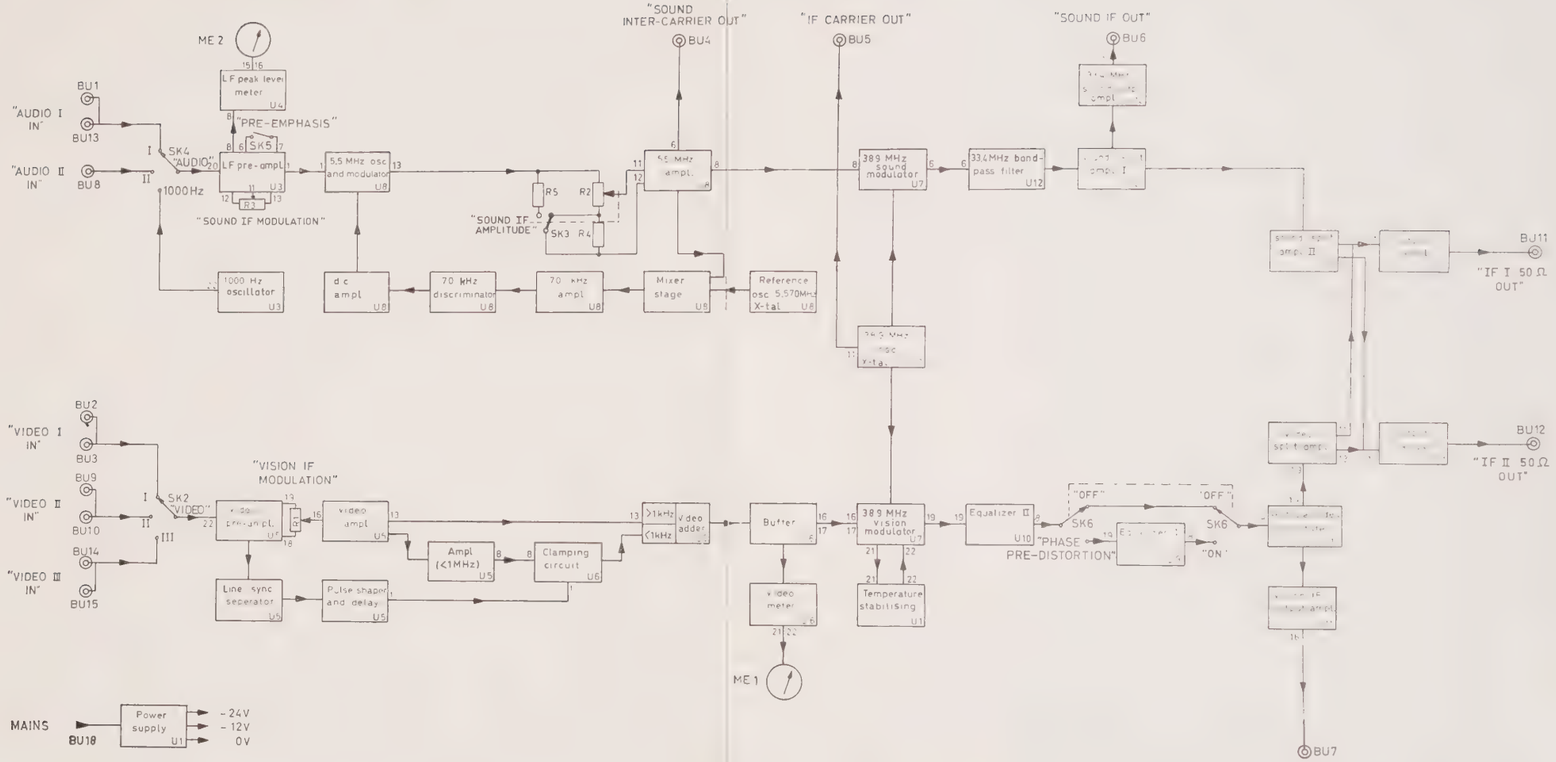


Fig. IV-1 Block diagram (E-version)

For A-version read:
4.5 MHz instead of 5.5 MHz
4.570 MHz instead of 5.570 MHz
34.4 MHz instead of 33.4 MHz

For B-version:
6.0 MHz instead of 5.5 MHz
6.070 MHz instead of 5.570 MHz
33.5 MHz instead of 33.4 MHz
39.5 MHz instead of 38.9 MHz

V Installation

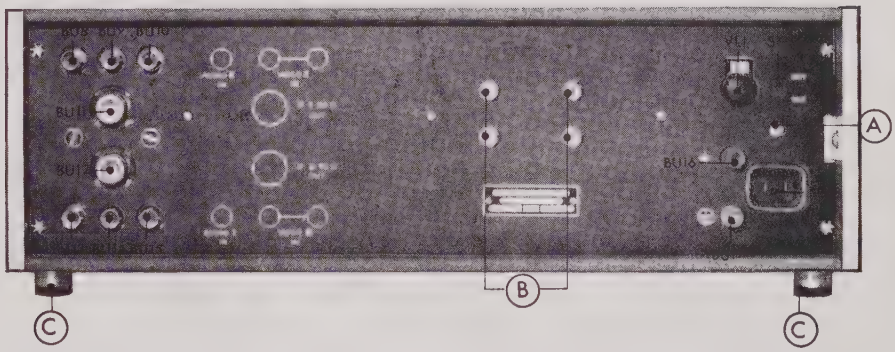


Fig. V-1 Rear view

A. Adjusting to the local mains voltage

By means of voltage selector SK7 the instrument can be adjusted to mains voltages of 115 V ±20% or 230 V ±20%.
The selected value can be read near the switch.
The instrument can be adjusted to the other mains voltage as follows:
- loosen screw "A" (Fig. V-1)
- set the switch to the desired range
- fasten screw "A" again
- replace fuse VL1:
  for 115 V - 800 mA (delayed-action type)
  for 230 V - 400 mA (delayed-action type)

B. Earthing

Earth the instrument in accordance with the local safety regulations.
The metal cabinet can be earthed via:
- socket BU17 (Fig. V-1)
- the earthing core of the mains flex.

The electrical circuit can be earthed via:
- socket BU16 (Fig. V-1)
- the screening of the coaxial connection cables.

Avoid double earthing of the electrical circuit, because this may introduce hum phenomena.

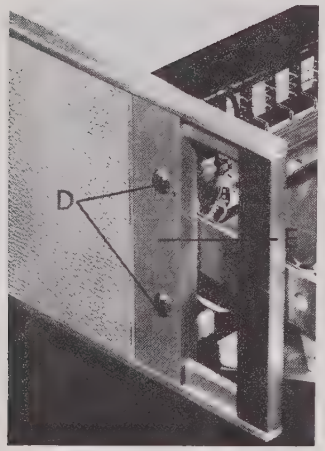


Fig. V-2 Side view

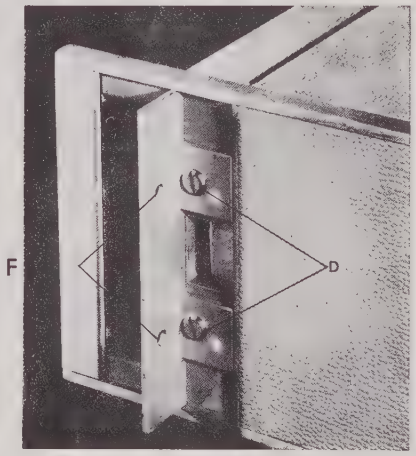


Fig. V-3 Side view

C. Mounting in a 19″ rack

- Remove the four screws ″B″ (Fig. V-1).
- Remove the four feet ″C″ (Fig. V-1) by turning them anti-clockwise.
- Screw the feet in the threaded holes (of screws ″B″) in the rear panel.
- Remove the screws ″D″ (Fig. V-2) and pull the brackets ″E″ out.
- Insert the brackets ″E″ as shown in Fig. V-3.
- The instrument can now be mounted in a 19″-rack with screws inserted through holes ″F″ in the brackets ″E″.

VI Survey of controls and sockets

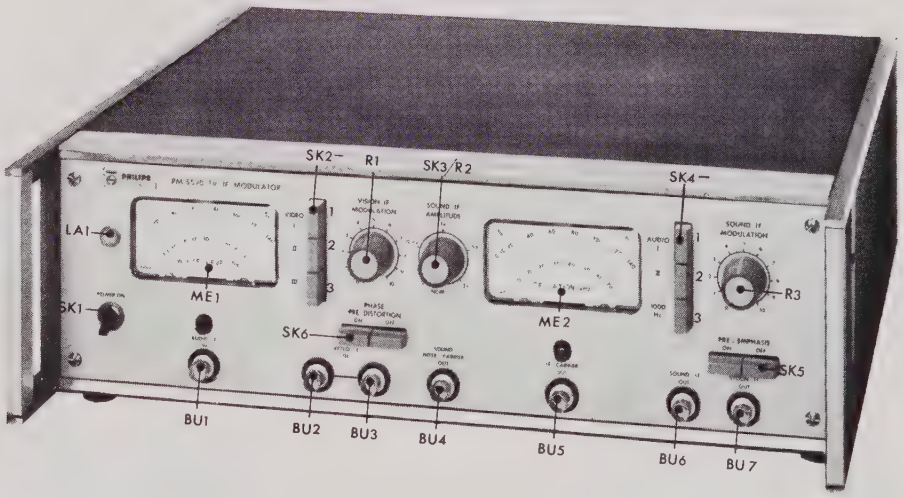


Fig. VI-1 Front view

A. Front of the instrument (see Fig. VI-1)

BU1 "AUDIO I IN"
input socket for an external audio signal if SK4-1 is depressed.
This socket is interconnected with BU13 (rear; "AUDIO I IN").

BU2 and BU3 "VIDEO I IN"
input sockets (interconnected) for an external video signal if SK2-1 is depressed.

BU4 "SOUND INTERCARRIER OUT"
output socket for the modulated sound intercarrier

BU5 "IF CARRIER OUT"
output socket for the vision IF carrier*

BU6 "SOUND IF OUT"
output socket for the (modulated) sound IF carrier

BU7 "VISION IF OUT"
output socket for the (modulated) vision IF carrier

* Can be modified to an input socket for an external IF carrier of the same frequency, see section "Modifications"

SK1 "POWER ON"
mains switch
With lever in upper position the instrument is switched on. Then LA1 will light up.

SK2–1 "VIDEO I"
if depressed, the vision IF carrier will be modulated with an external video signal applied to BU2 or BU3 ("VIDEO I IN")

SK2–2 "VIDEO II"
if depressed the vision IF carrier will be modulated with an external video signal applied to BU9 or BU10 ("VIDEO II IN")

SK2–3 "VIDEO III"
if depressed, the vision IF carrier will be modulated with an external video signal applied to BU14 or BU15 ("VIDEO III IN")

SK3/R2 "SOUND IF AMPLITUDE"
control for the amplitude of the sound IF carrier
In position "NOM" this carrier has the nominal value.

SK4–1 "AUDIO I"
if depressed, the sound IF carrier will be modulated with an external audio signal applied to BU1 or BU13 ("AUDIO I IN")

SK4–2 "AUDIO II"
if depressed the sound IF carrier will be modulated with an external audio signal applied to BU8 ("AUDIO II IN")

SK4–3 "AUDIO 1000 Hz"
if depressed, the sound IF carrier will be modulated with the internal 1000 Hz audio signal

SK5 "PRE-EMPHASIS"
if push-button "ON" is depressed, a pre-emphasis in the sound signal is introduced.

SK6 "PHASE PRE-DISTORTION"
if push-button "ON" is depressed, a phase pre-distortion is introduced for the video signal (see Fig. II-1)

R1 "VISION IF MODULATION"
control of the video modulation depth
The modulation depth (upper dial) or the white value (lower dial) can be read from meter ME1.

R3 "SOUND IF MODULATION"
control for the frequency sweep of the sound IF carrier
The modulation depth (upper dial) or frequency sweep (lower dial) can be read from meter ME2.

LA1
pilot lamp; lights up when the instrument is switched on.

B. Rear of the instrument (see Fig. VI-2)

BU8 "AUDIO II IN"
input socket for an external audio signal if SK4–2 is depressed

BU9 and BU10 "VIDEO II IN"
input socket for an external video signal if SK2-2 is depressed

BU11 "IF I 50Ω OUT"
output socket for the composite IF signal

BU12 "IF II 50Ω OUT"
output socket for the composite IF signal

BU13 "AUDIO I IN"
interconnected with BU1 (front.)

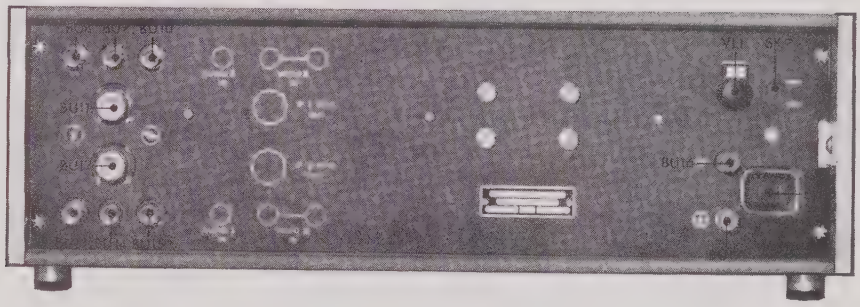


Fig. VI-2 Rear view

BU14 and BU15 "VIDEO III IN"
input sockets (interconnected) for an external video signal if SK2–3 is depressed

BU16 "⏚"
socket for earthing the electrical circuit

BU17 "⏚"
socket for earthing the cabinet

BU18
mains socket

SK7 "115 V–230 V"
mains voltage selector. The position of this switch can be changed if screw "A" is loosened a few turns.

VL1
safety fuse: 230 V, 200 mA: delayed action type
115 V, 400 mA: delayed action type

Note: The output sockets BU11 "IF I 50 Ω out" and BU12 "IF II 50 Ω out" at the rear of the instrument are fitted with RF capacitors in order to stop circulating hum currents.

VII Modifications

This section deals with the modifications to be carried out to the PM 5590 to make it suitable for use with an external IF carrier.

1. Modification from internal IF to external IF carrier.

- Remove crystal X1 (see Fig. XIII-2)
- Remove the connection between points "e" and "f"
- Interconnect points "e" and "g".
  The external IF carrier can then be applied via BU5, to terminal 13 of unit 7. In that case the cable from BU5 connected to terminal 11 of unit 7 should be connected to terminal 13 of the same unit (see Fig. VIII-1, Wiring diagram).
  The external IF carrier amplitude should be 200 mV_{p-p}, terminated with 75 Ω.

2. Modification from external IF to internal IF carrier.

- Replace crystal X1 (see Fig. XIII-2)
- Remove the connection between "e" and "g"
- Interconnect points "e" and "f".
  The cable from BU5 which is connected to terminal 13 of unit 7 should be connected to terminal 11 of the same unit.

Note: Following these modifications, unit 7 should be checked and, if necessary, readjusted.

IF frequency
Sound IF-modulator
Vision IF-modulator
} See checking and adjusting Section XIII-unit 7

In the following chapters the circuitry of the units has been explained. The service-adjustments have been described at the end of the chapter concerned.

Please bear in mind the following notes:

- The unit on which checking or adjusting is to be made, should be placed on the "EXTENSION BOARD", unit 2 of the instrument.
- terminate parallel input sockets with 75 Ω (VIDEO I-II-III).
- The tolerances mentioned are factory tolerances which apply when re-adjusting the instrument. They may differ from those shown in section "GENERAL", chapter "TECHNICAL DATA".
- The voltages shown in the diagram and the oscillograms published are measured with respect to terminal 12 (instrument connected to 220 V~).
- The d.c. voltages are measured with a PHILIPS d.c. voltmeter PM 2430.
- The a.c. voltages on unit 1 are measured with a PHILIPS a.c. voltmeter PM 2451.
- The oscillograms are measured with a PHILIPS oscilloscope PM 3330 in connection with a PHILIPS double trace unit PM 3342 and a PHILIPS time base delay unit PM 3347.
- The oscillograms are photographed with a PHILIPS camera outfit PM 9300.
- The diagrams are provided with figures for reference; 40 for example, refers in the diagram to oscillogram no. 40.

N.B. Disconnect the mains before exchanging printed wiring units!

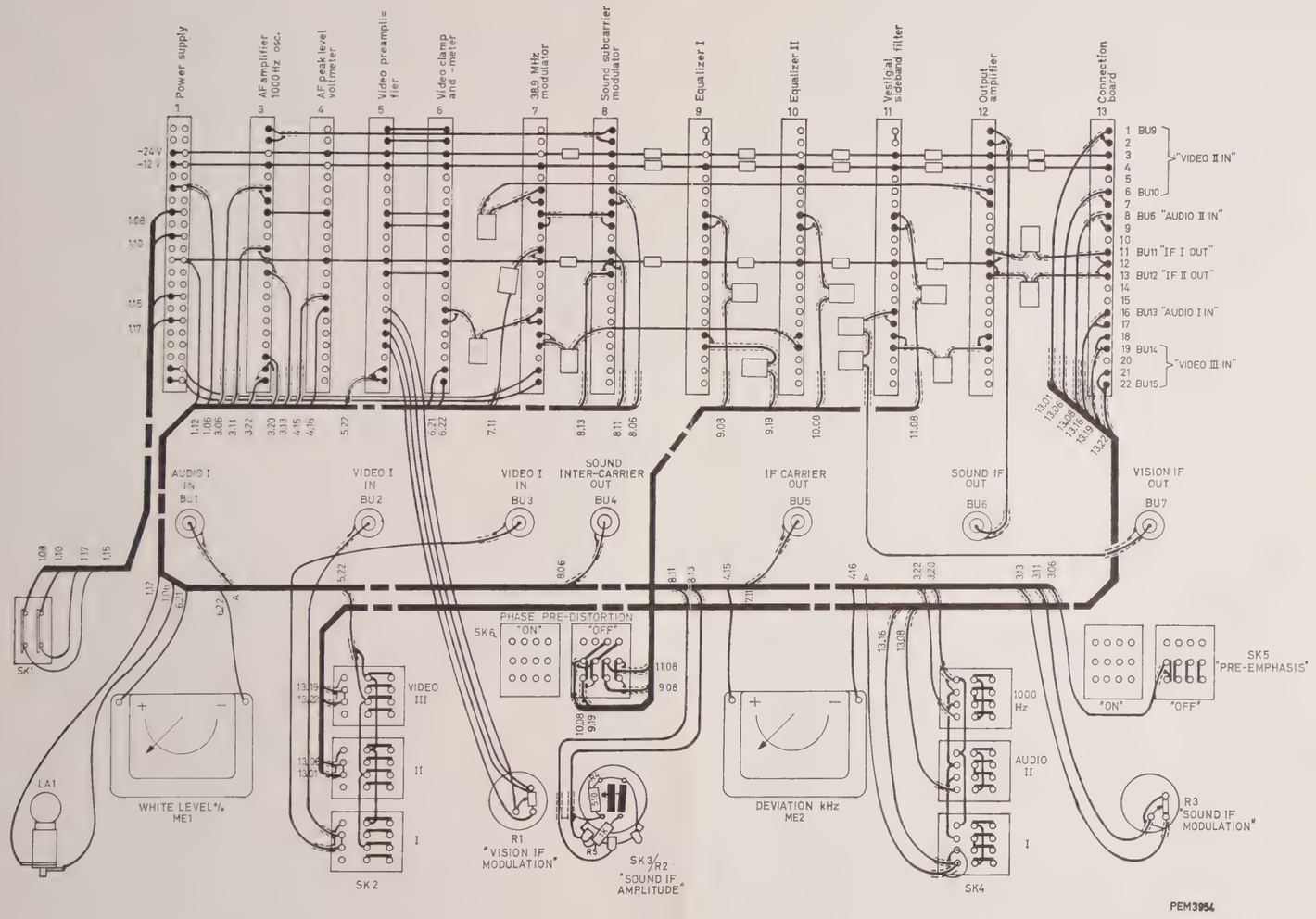


Fig. VIII-1 Wiring diagram

VIII Unit 1

Power supply

The power supply unit comprises two stabilized 12 V-rectifiers and a circuit controlling the current for the diode oven in the vision modulator (unit 7).
The two 12 V-rectifiers GR5, TS13, TS1, TS2, TS3, TS4 and GR6, TS14, TS5, TS6, TS7 and TS8 respectively, are of the conventional stabilized type.

The control voltage is obtained by comparing the voltage across voltage divider GR3–R9 (GR4–R21) with the voltage across R11, R12 (R23, R24) by means of TS4 (TS8).
The control voltage is amplified by TS3, TS1 (TS7, TS6) and controls the current through TS13 (TS14).
Transistor TS2 (TS5) protects the power supply against overloading. This transistor is biased so that it is normally cut off. However, if the power supply is overloaded, the voltage across R7 (R19) will increase to such a value that the transistor becomes conductive thus reducing the current through TS13 (TS14).
GR1–GR2 is a stabilized rectifier for biasing TS1, TS2 and TS3. TS9...TS12 control the current to the diode oven (R40...R44) of the vision modulator in unit 7.

The oven is heated by means of five 0.25 W-resistors. The temperature of the oven is "measured" by means of a built-in NTC resistor (R39, in unit 7), controlling the current through TS12 via TS9...TS11, and thus the current to the oven.
TS9–TS10 form a differential amplifier, i.a. to ensure temperature stability.

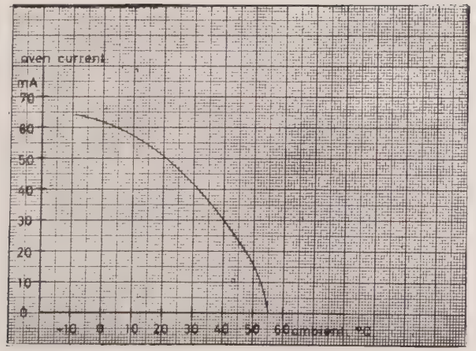
Checking and adjusting

Measuring equipment:
DC Voltmeter e.g. PHILIPS PM 2430
DC mA-meter e.g. PHILIPS PM 2410 or PM 2411
Oscilloscope e.g. PHILIPS PM 3230

The stabilized voltages should not change more than ± 0.5% with mains voltage variations between 185 V and 275 V and between 95 V and 135 V respectively.
The following checks and readjustments are to be carried out at nominal mains voltage.
Check the d.c. voltages, they should be within 2%.
Check the ripple-voltages at a mains voltage of 185 V (voltage selector in position "230 V").
At —12 V, —24 V } 10 $mV_{p\ p}$

The ambient temperature of the oven for the vision modulator (Unit 7) should correspond to the current in R40...R44 (Unit 7) as indicated in the figure below.

This current should be measured after the PM 5590 has been in operation for more than 15 minutes. For measuring, remove the interconnection on the soldering tags between the collector of TS12 and terminal 22 and connect the mA-meter to the tags.
If current and ambient temperature do not correspond to the curve in the figure, adjust current with R32 (6.8 kΩ...18 kΩ).
Bear in mind that the current requires some time to become stable.



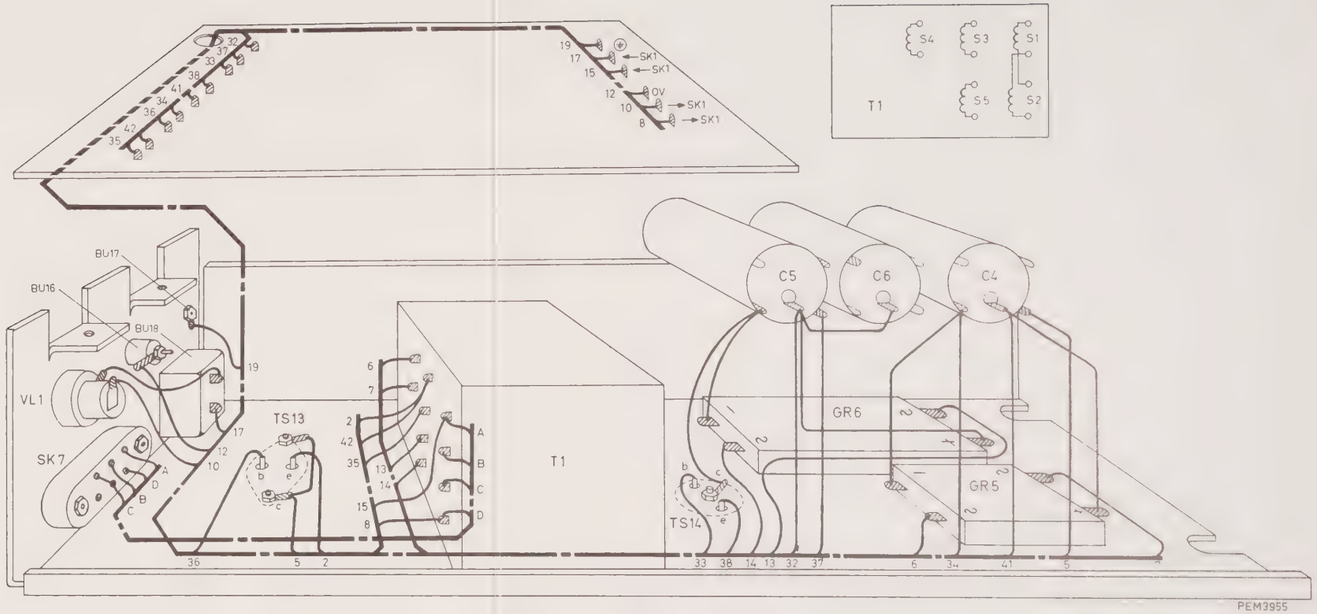


Fig. VIII-2 Wiring, power supply, unit 1

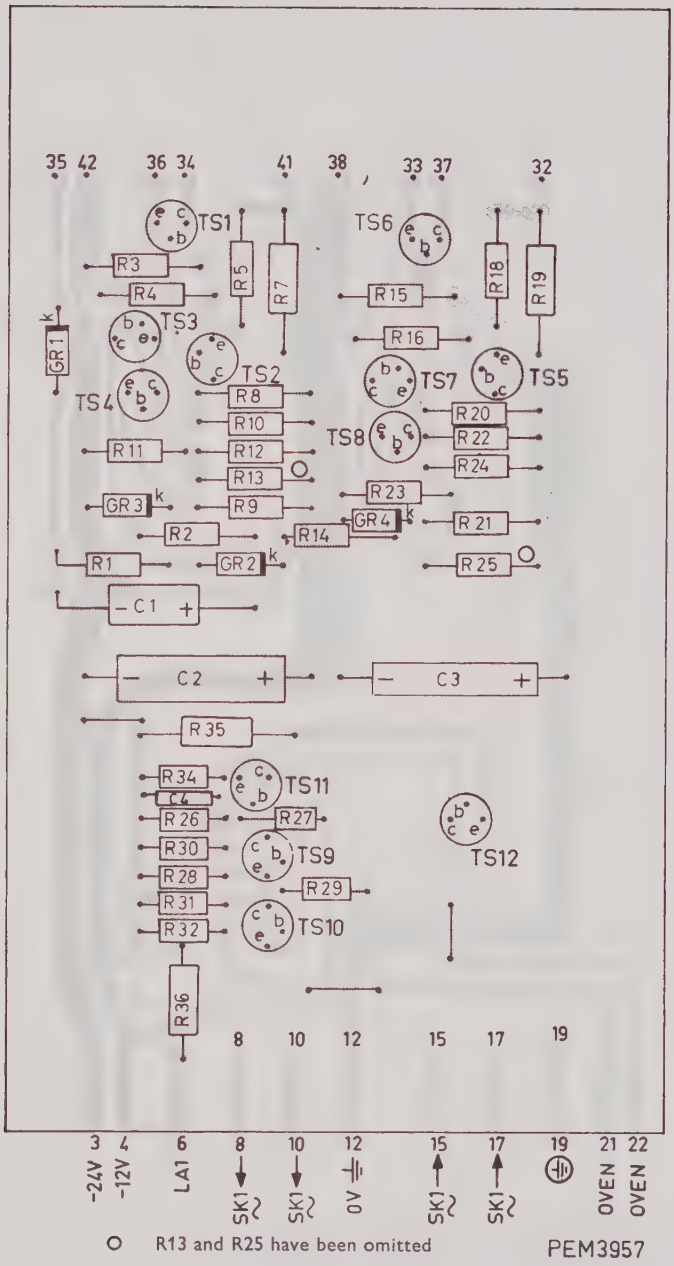
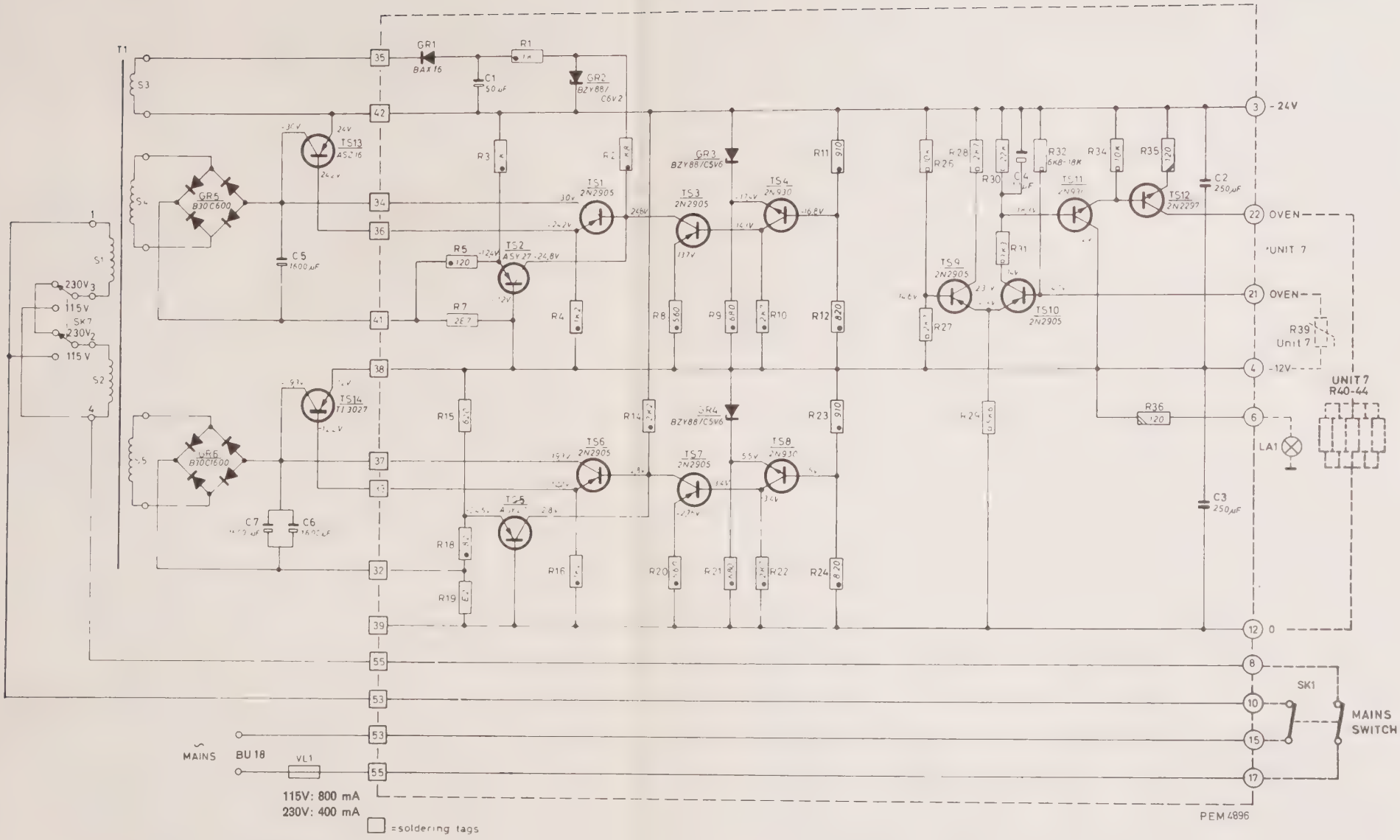


Fig. VIII-3 Printed wiring board, power supply, unit 1



In /05/06/07 version: R5 = 68 Ω – ½ W
R7 = 1.2 Ω – 1 W

Fig. VIII-4 Circuit diagram, power supply, unit 1

IX Unit 3

1000-Hz Oscillator and LF pre-amplifier

The 1000-Hz RC-generator TS1...TS4 is a stabilized Wien bridge oscillator. The frequency range is determined by C1–R1–C2–R2.
Potentiometer R33 serves for adjusting the frequency.
The amplifier is of the two stage type (TS1 and TS2) followed by emitter follower TS3–TS4.
Positive feedback is effected from the emitters of TS3 and TS4 to the base of TS1 via the Wien bridge.
The output voltage of the oscillator is stabilized by means of negative feedback. This negative feedback takes place from the emitters of TS3 and TS4 to the emitter of TS1 via C7–R11.
R11 is a NTC-resistor, whose resistance depends on the output voltage of the oscillator, so that the emitter bias is stabilized.
NTC-resistor R16 serves to compensate for variations of the output voltage which are due to temperature fluctuations on R11.

The LF pre-amplifier is also of the two-stage type (TS5... TS6 and output amplifier TS7...TS9).
The first stage is stabilized by means of negative a.c.-d.c. feedback via R22–R23.
Via C11, input resistor R20 is connected to the emitter of TS5, so that an extremely high input impedance is obtained via a bootstrap circuit. The output amplifier also has a strong negative a.c.-d.c. feedback via R30. It provides stable amplification, flat frequency response and low output impedance. The amplification is adjusted with R28.
The signal amplitude is adjustable with R3 "SOUND IF MODULATION" on the front of the instrument. R34 serves to match the signal amplitude to the sensitivity of the following modulator. A pre-emphasis is obtained by connecting network R29/C17 to earth by means of switch SK5 "PRE-EMPHASIS ON" on the front of the instrument.

Checking and adjusting

Measuring equipment:	
LF Voltmeter	e.g. PHILIPS PM 5140
Frequency counter (1 kHz)	e.g. PHILIPS PM 2451
Frequency sweep measuring equipment	e.g. HP 5245L
	e.g. MARCONI TF 2300 or RADIOMETER AFM1

Frequency of the RC-generator

Check that the frequency of the signal at terminal 22 is 1000 Hz ±2 Hz. If not, readjust R33.

Pre-emphasis

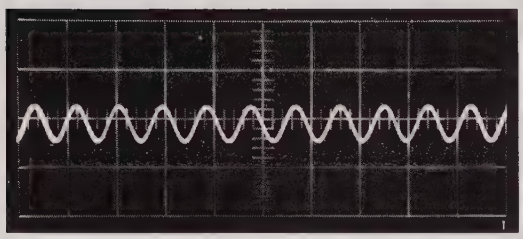
Apply an LF sinewave signal of 3200 Hz (B- and E-version) or 2100 Hz (A-version) to terminal 20.
SK5 in position "PRE-EMPHASIS OFF".
Adjust its amplitude to obtain 775 mV at terminal 8.
SK5 in position "PRE-EMPHASIS ON". The amplitude of the signal at terminal 8 should increase to 1.1 V.

Sensitivity of sound pre-amplifier

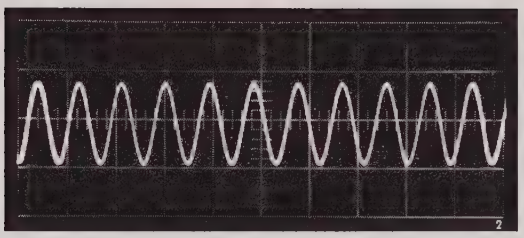
Apply a 1000 Hz-sinewave of 77.5 mV to one of the audio-inputs (BU1/13–BU8) and depress the corresponding switch "AUDIO" (SK4) SK5 in position "PRE-EMPHASIS OFF". Set control "SOUND IF MODULATION" (R3) so that the sound level meter indicates 100% (= 50 kHz for B- and E-version, or = 25 kHz for A-version).
If this is dot possible, select another value for R28 (150Ω...390Ω).

Sound level meter and frequency sweep

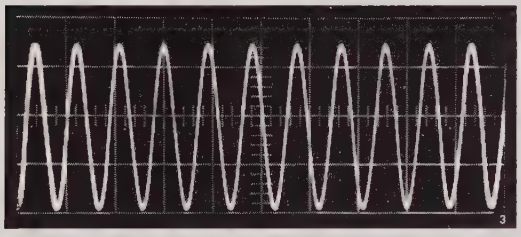
Depress switch "1000 Hz". Set control "SOUND IF MODULATION" (R3) so that the sound level meter indicates 100% (= 50 kHz for B- and E-version, or = 25 kHz for A-version). Connect the frequency sweep measuring equipment to socket "SOUND INTERCARRIER" (BU4) and check that the actual frequency sweep is 50 kHz ± 1 kHz. (B- and E-version) or 25 kHz ± 1 kHz (A-version). If not, adjust R34.



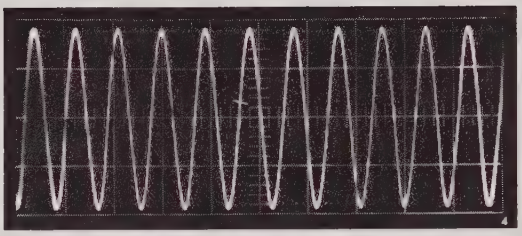
1. 0.5 V/cm 1 ms/cm



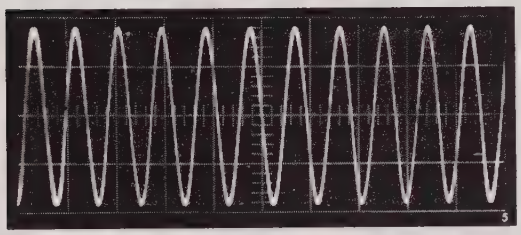
2. 0.5 V/cm 1 ms/cm



3. 0.5 V/cm 1 ms/cm



4. 0.5 V/cm 1 ms/cm



5. 0.5 V/cm 1 ms/cm

Fig. IX-1 Oscillograms, unit 3

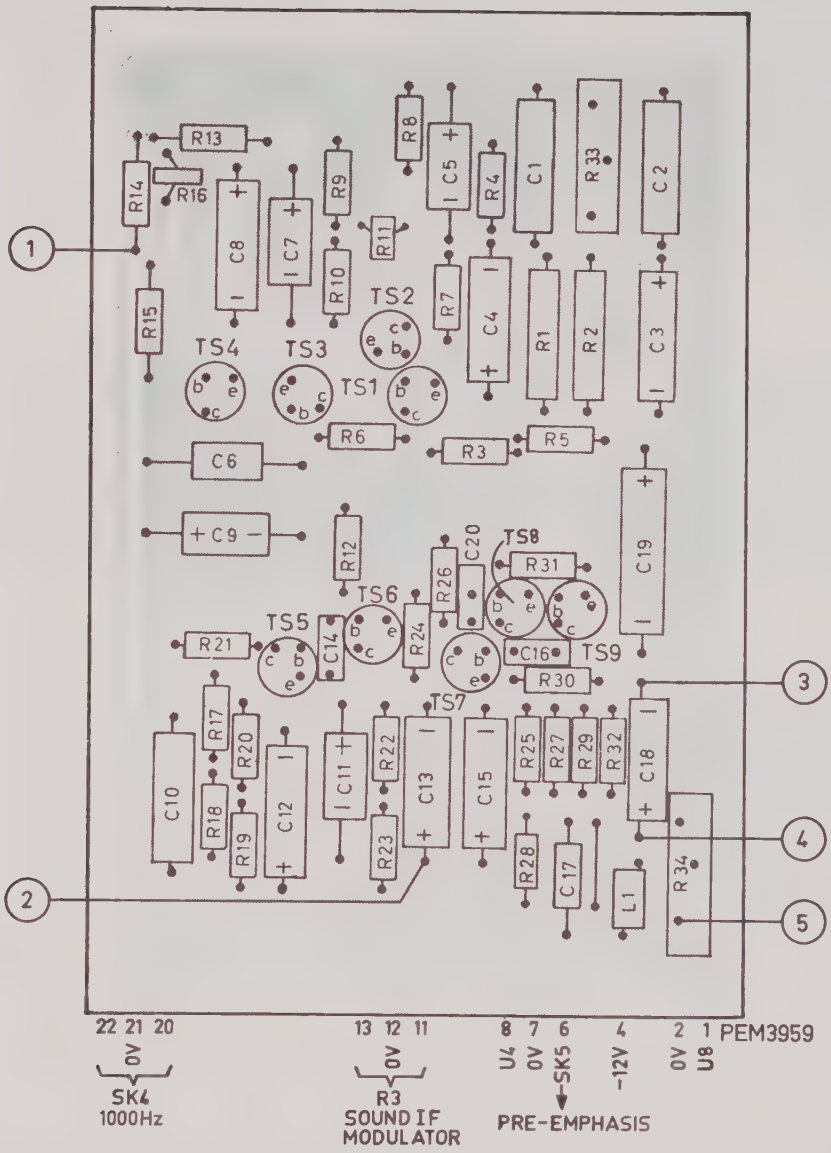


Fig. IX-2 Printed wiring board, 1000 Hz oscillator and LF pre-amplifier, unit 3

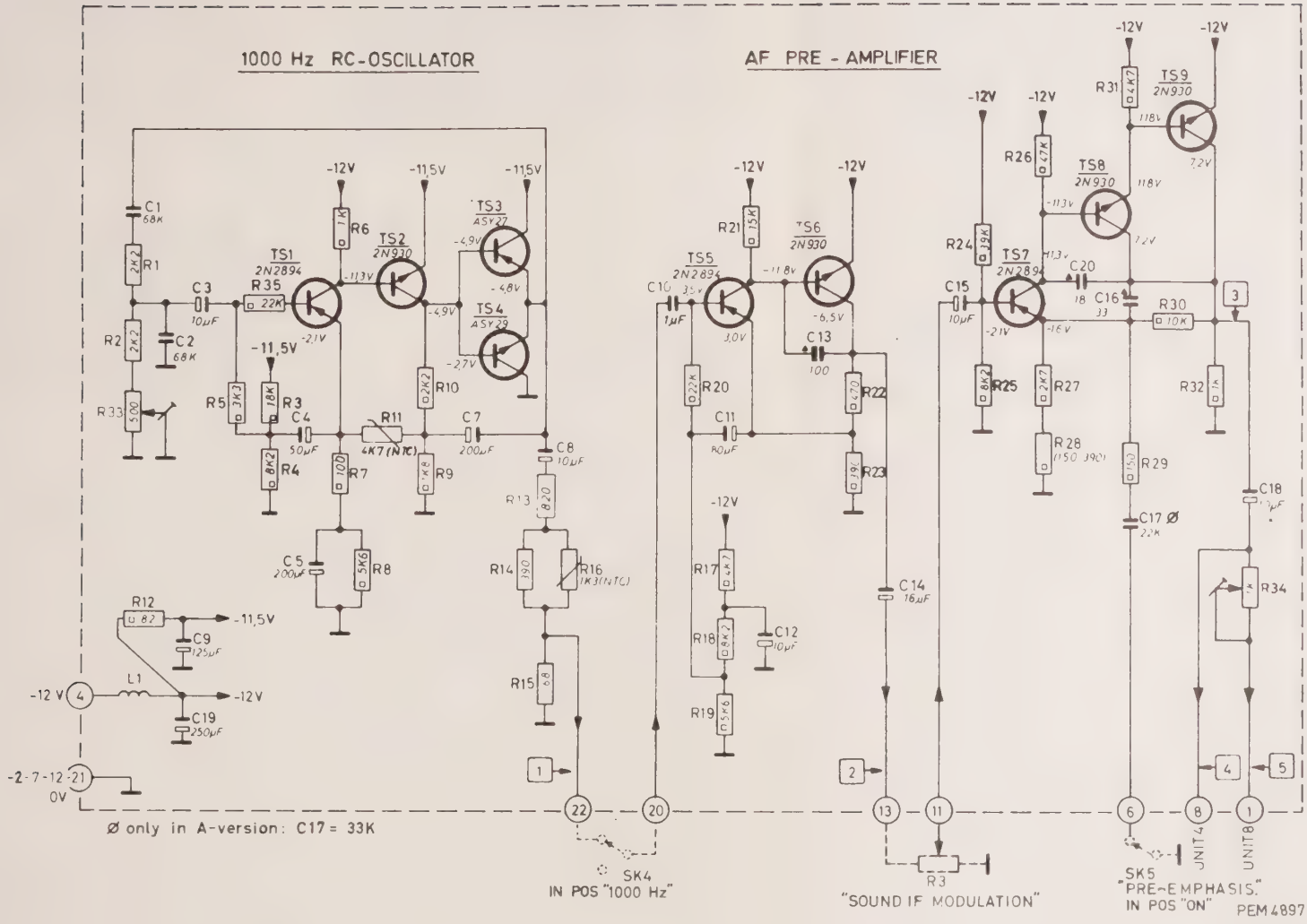


Fig. IX-3 Circuit diagram, 1000 Hz oscillator and LF pre-amplifier, unit 3

X Unit 4

LF Peak-level meter

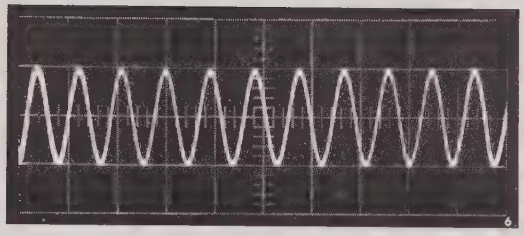
This circuit consists of a power amplifier, a peak-to-peak detector and a d.c. voltmeter.
The power amplifier consists of a two stage pre-amplifier (TS1 and TS2) and a Darlington push-pull output stage (TS3...TS6).
A combined a.c. and d.c. negative feedback is applied to the emitter of TS1, via R8, to obtain stable amplification and low source impedance for the peak-to-peak detector.
The output voltage of the power amplifier is rectified in peak detectors GR1 and GR2 and measured in a bridge circuit containing voltmeter ME2. Amplifier TS7...TS12 has a 100% negative voltage feedback. Consequently, it only operates as current amplifier. The meter can be set to zero (electrical zero setting) by means of potentiometer R23.

Checking and adjusting

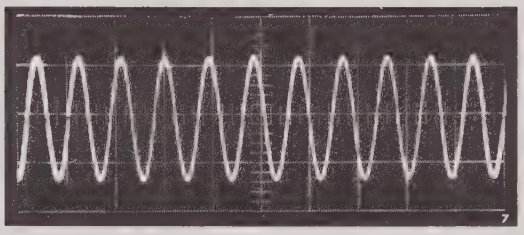
Check, and if necessary, readjust the mechanical zero setting of the sound level meter (ME2).
Mains power to the PM 5590 should be switched off.

Electrical zero setting

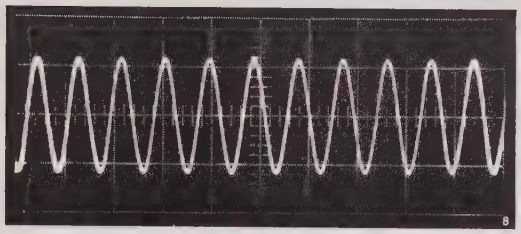
All three buttons "AUDIO" (SK4) should be released. The pointer of ME2 should be in position "0". If not, readjust R23.



6. 1 V/cm 1 ms/cm



7. 5 V/cm 1 ms/cm



8. 5 V/cm 1 ms/cm

Fig. X-1 Oscillograms, unit 4

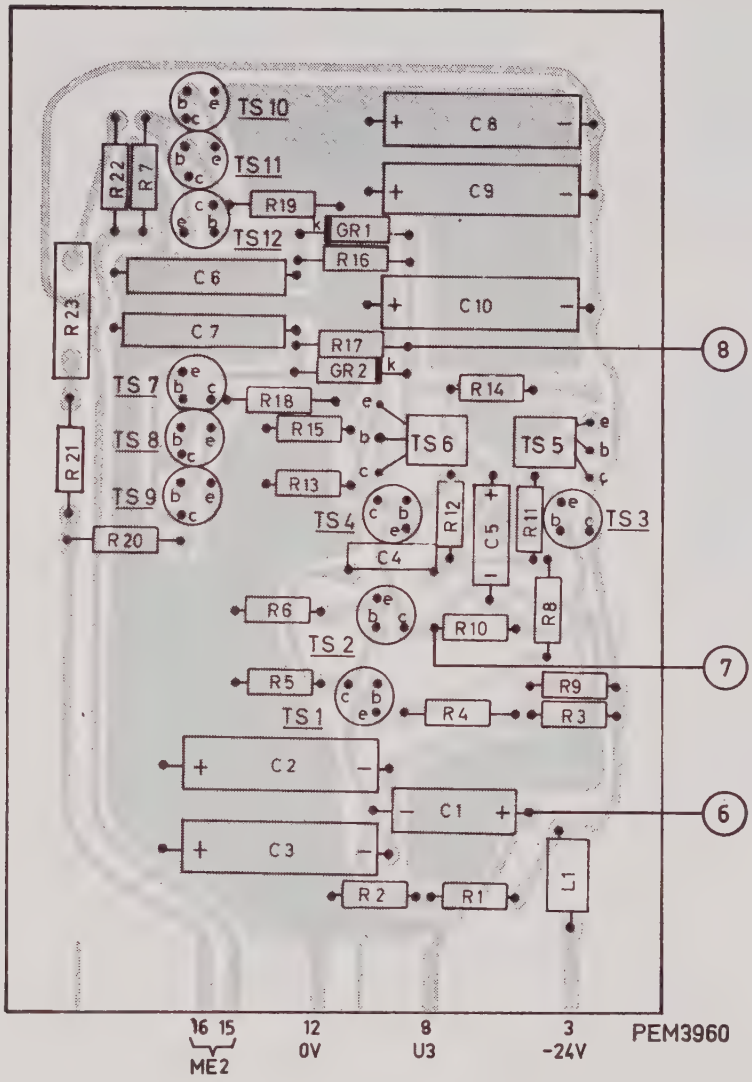


Fig. X-2 Printed wiring board, LF-peak level meter, unit 4

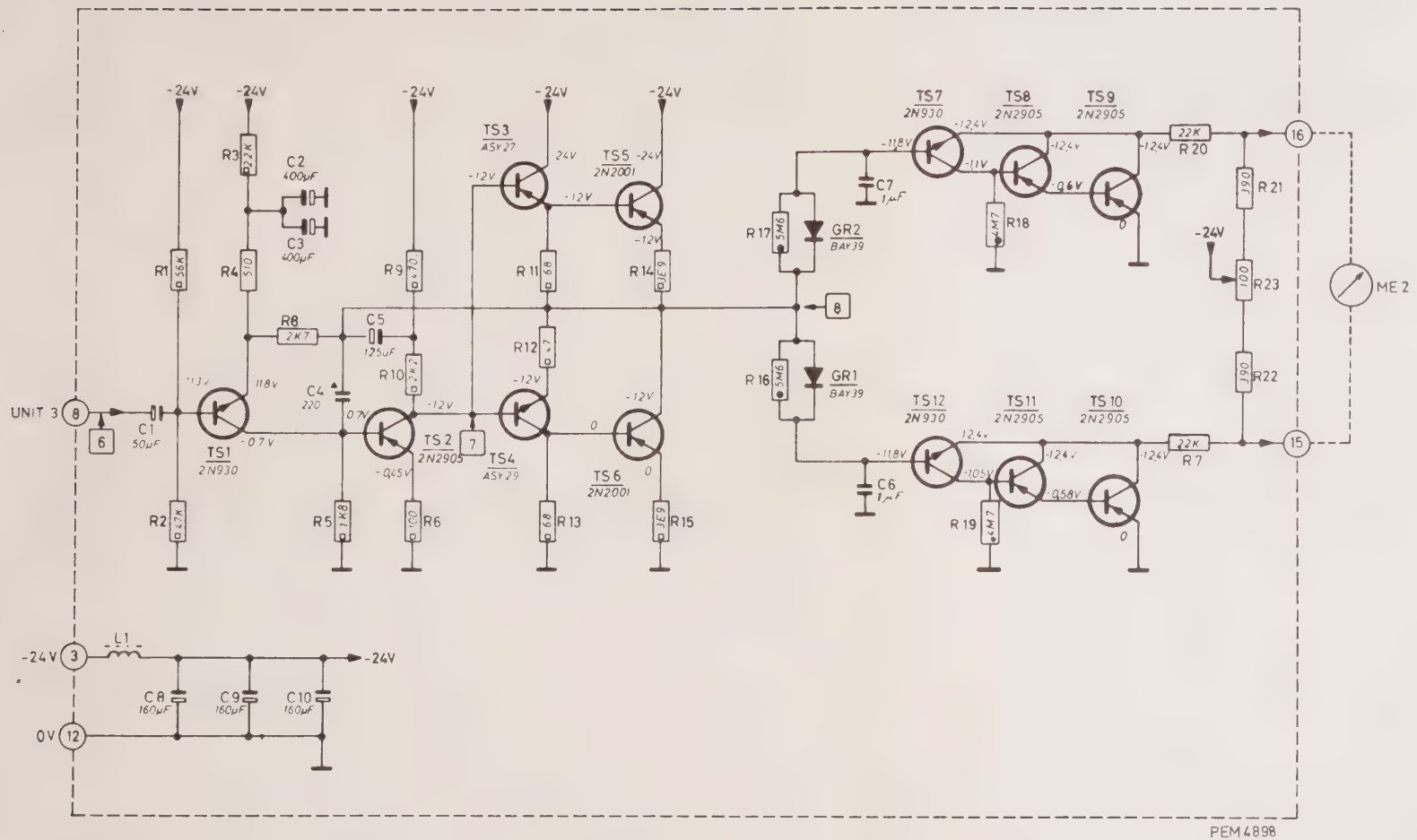


Fig. X-3 Circuit diagram, LF peak level meter, unit 4

XI Unit 5

Video amplifier-clamping circuit

This unit comprises a pre-amplifier, two video amplifiers, and a sync. separator followed by a delay circuit.
The video signal is applied to pre-amplifier TS1–TS2 via switch SK2 (VIDEO in I, II, III) on the front of the instrument. The pre-amplifier provides an amplification of 6 dB.
Via potentiometer R1 (VISION IF MODULATION) on the front of the instrument, the signal is applied, via video amplifier TS3–TS4, to clamping-driver amplifier TS5–TS6.
By means of potentiometer R40, the signal is adjusted so that the two amplifiers produce the same signal amplitude.
The output signals of the two video amplifiers are applied to the video adder and clamping circuits in unit 6 respectively.
The input signal for the clamping circuit consists of the line pulses which have been separated from the video signal.
Transistors TS7...TS10 form the complete separator. TS7 inverts the signal while TS8 and TS9 operate as a buffer amplifier applying the signal to TS10 via a low impedance.
The synchronizing pulses are separated in TS10.
The bias of TS10 is chosen so that only the sync. signals are amplified. From the separator, these pulses are applied via differentiating circuit C19–R33, to pulse shaper TS11 which is conductive only during the positive part of the differentiated signal.
A negative pulse is also generated on the collector of TS11. The start of this pulse coincides with the trailing edge of the line pulse.
The later pulse (2 µs) is then delayed across L7–C20, and applied, via TS12, to the clamping circuit in unit 6.

Checking and adjusting

Measuring equipment:

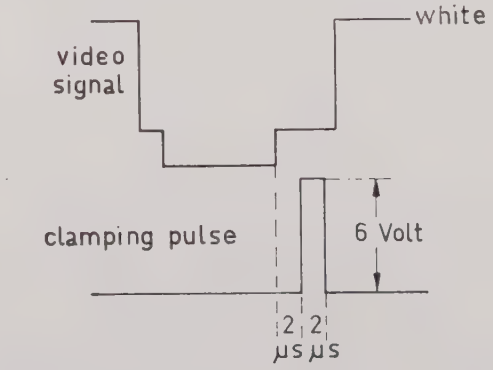
Pattern generator	PHILIPS PM 5540
Oscilloscope	e.g. PHILIPS PM 3330
with time base delay unit	e.g. PHILIPS PM 3347
and double trace-unit	e.g. PHILIPS PM 3342

The amplification of the vision pre-amplifier

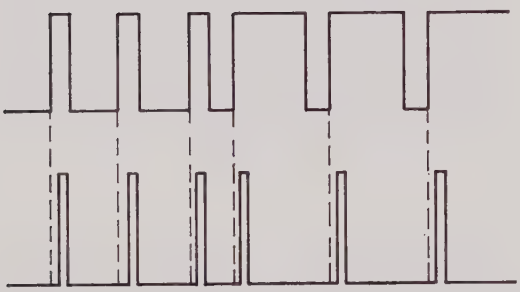
Apply a 1 $V_{p\text{-}p}$ video signal (e.g. the vertical bar pattern of the PM 5540) to one of the video inputs (BU2/3–BU9/10–BU14/15), terminate the parallel socket with 75 Ω and depress the corresponding switch "VIDEO" (SK2).
Set control "VISION IF MODULATION" (R1) to position "10". Connect the oscilloscope to terminal 8. The video signal level on this terminal should be between 3.5 and 4.1 $V_{p\text{-}p}$; depending on the adjustment of R40, for the latter, refer to the description of unit 6.

The sync. separator

Apply a vertical bar video signal to one of the video inputs as described in the previous check. Connect the Y_B amplifier of the oscilloscope to terminal 1.
Connect the Y_A amplifier to the video input signal. When using delayed sweep, check that clamping pulses appear only after every line pulse as indicated in the figure below.



During the field synchronising period, the clamping pulses should appear as indicated in the figure below.



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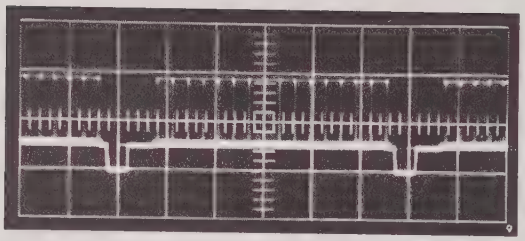
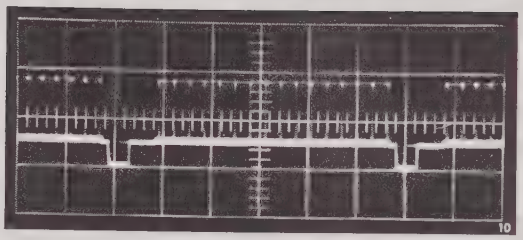
If any of these conditions is not met, transistor TS10 must be replaced.

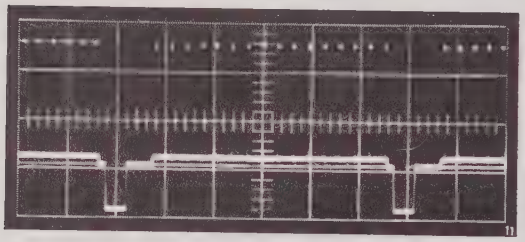
For adjusting R40, refer to the description of unit 6



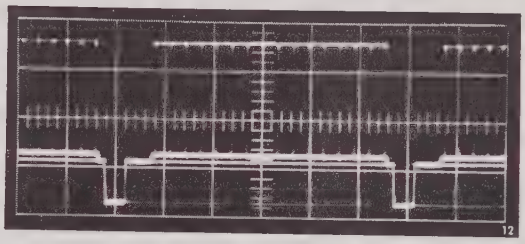
9. 0.5 V/cm 10 μs/cm



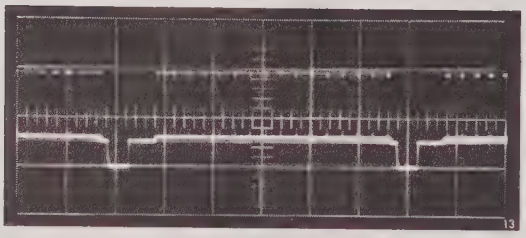
10. 0.5 V/cm 10 μs/cm



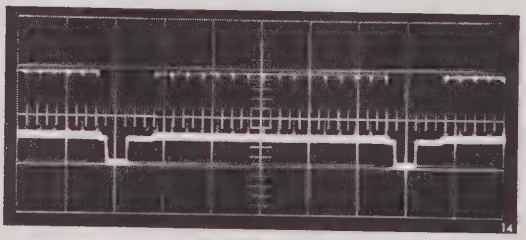
11. 0.5 V/cm 10 μs/cm



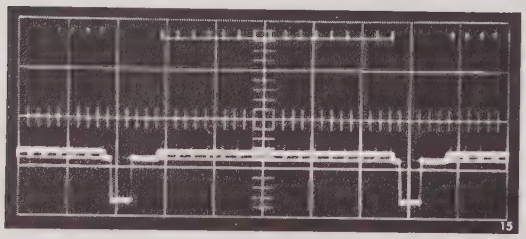
12. 0.5 V/cm 10 μs/cm



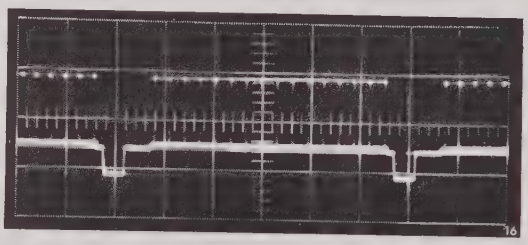
13. 0.5 V/cm 10 μs/cm



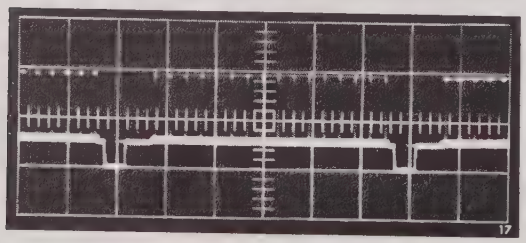
14. 0.5 V/cm 10 μs/cm



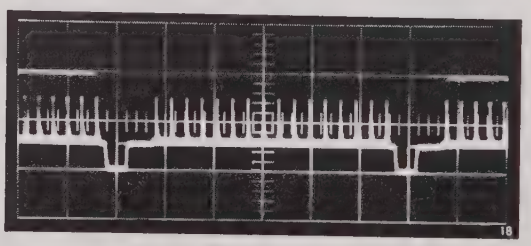
15. 0.5 V/cm 10 μs/cm



16. 0.5 V/cm 10 μs/cm

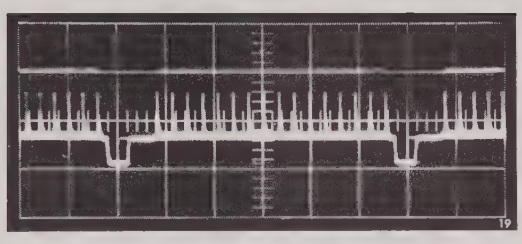


17. 0.5 V/cm 10 μs/cm

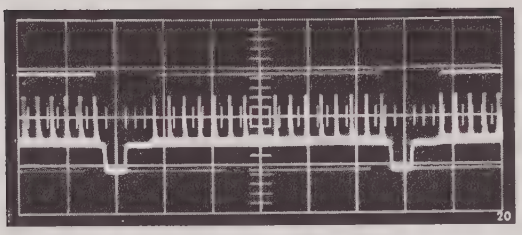


18. 0.5 V/cm 10 μs/cm

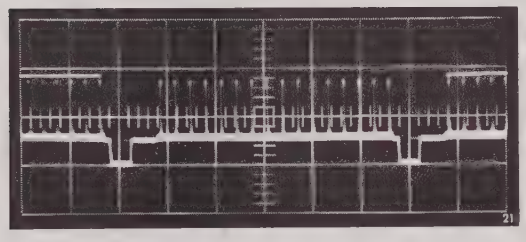
Fig. XI-1 Oscillograms, unit 5



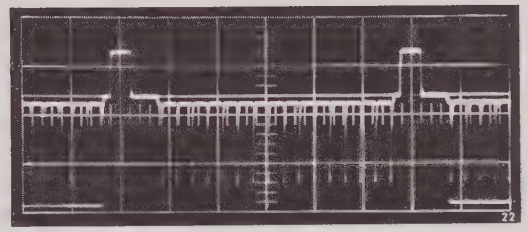
19. 0.5 V/cm 10 μs/cm



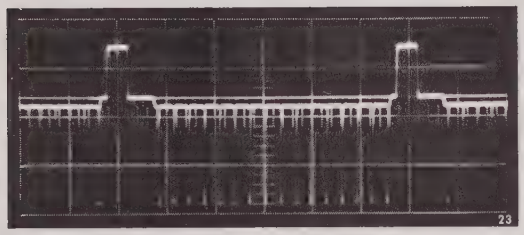
20. 1 V/cm 10 μs/cm



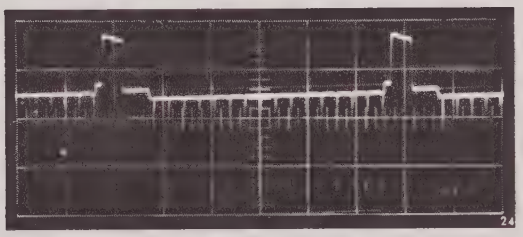
21. 0.5 V/cm 10 μs/cm



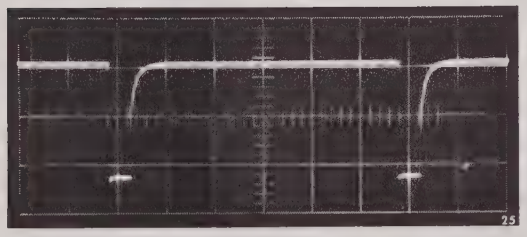
22. 0.5 V/cm 10 μs/cm



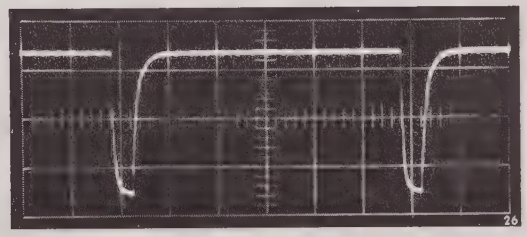
23. 0.5 V/cm 10 μs/cm



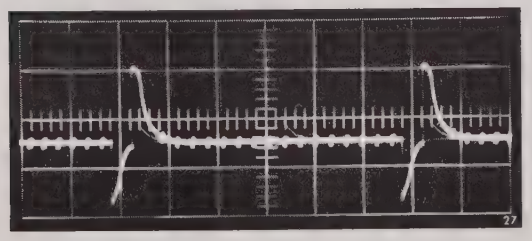
24. 0.5 V/cm 10 μs/cm



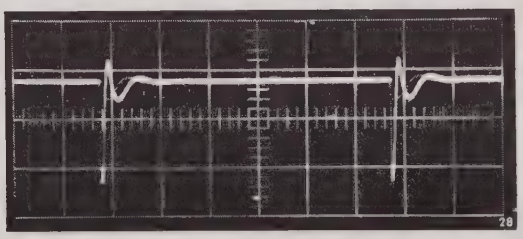
25. 5 V/cm 10 μs/cm



26. 2 V/cm 10 μs/cm

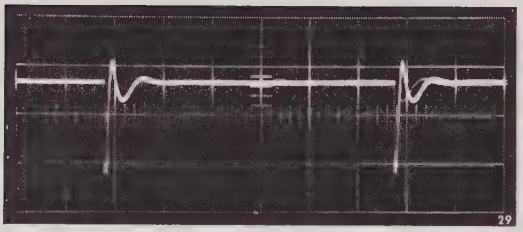


27. 0.5 V/cm 10 μs/cm

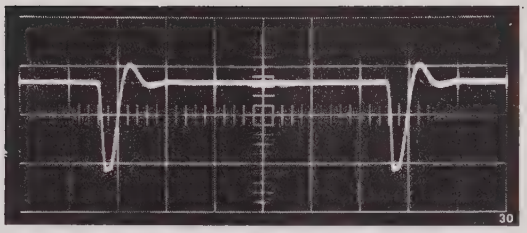


28. 5 V/cm 10 μs/cm

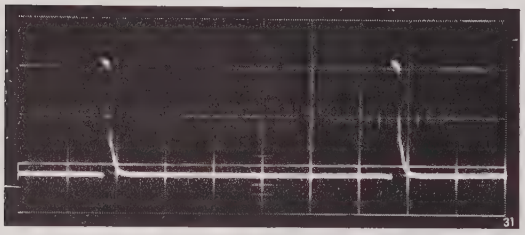
Fig. XI-1 Oscillograms, unit 5



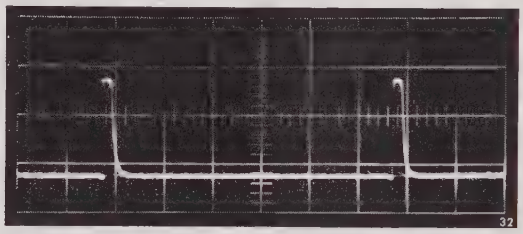
29. 5 V/cm 10 μs/cm



30. 2 V/cm 10 μs/cm



31. 5 V/cm 10 μs/cm



32. 2 V/cm 10 μs/cm

Fig. XI-1 Oscillograms, unit 5

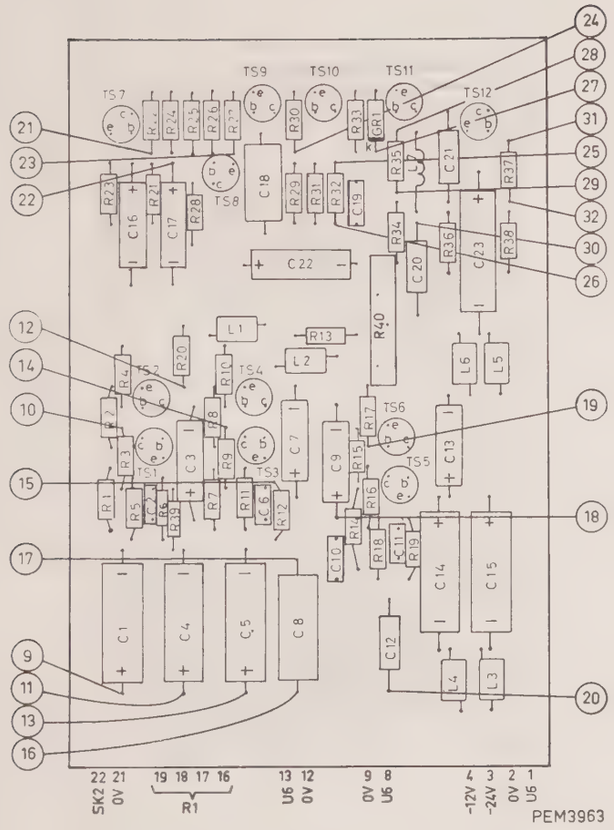
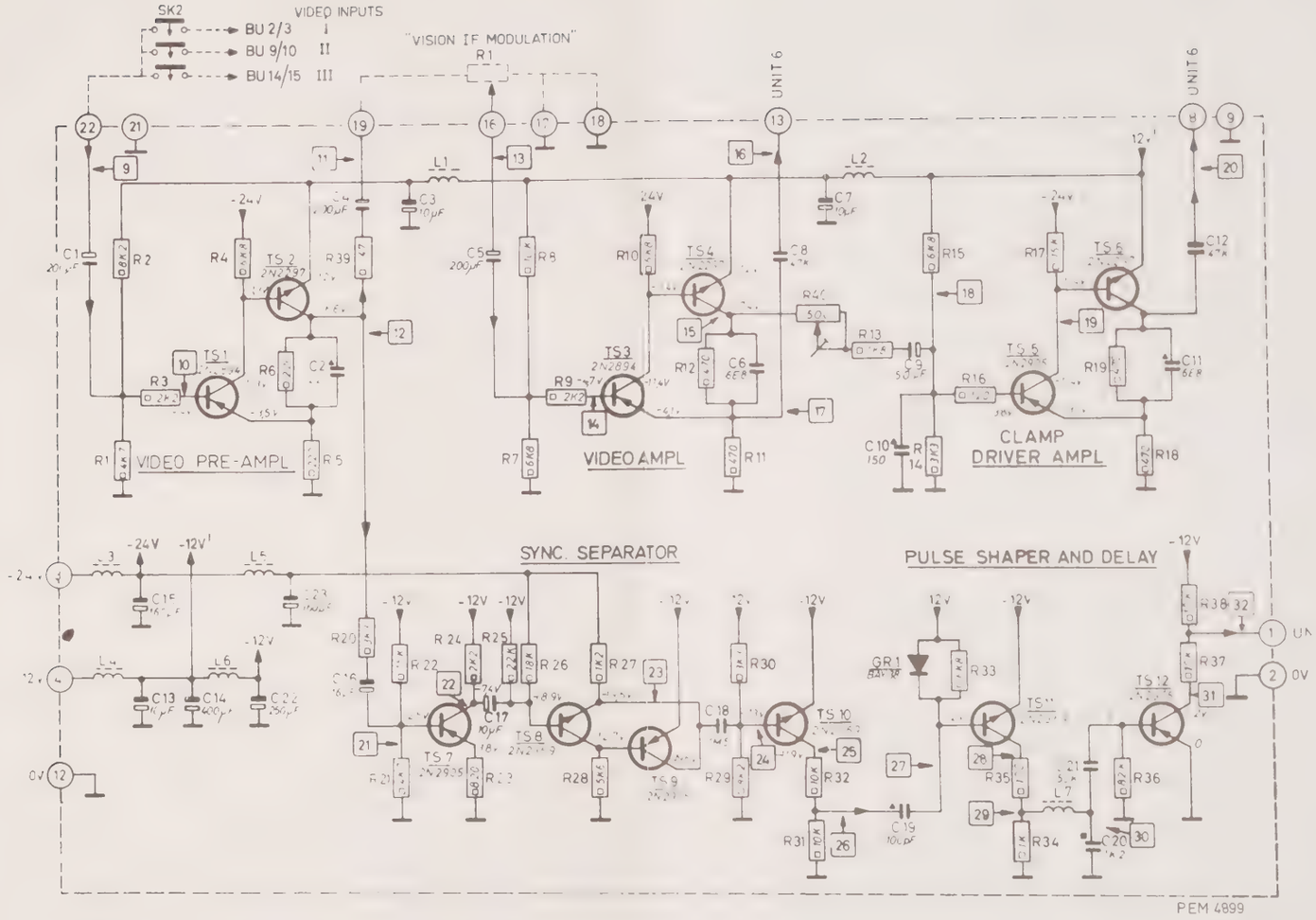


Fig. XI-2 Printed wiring board, video amplifier-clamping circuit, unit 5



In 05/06/07 version: C 10 = 1 KpF

Fig. XI-3 Circuit diagram, video amplifier-clamping circuit, unit 5

XII Unit 6

Video clamping and meter circuits

This unit consists of a video clamping and adder circuit, a modulator buffer amplifier and a video-meter circuit.
Video clamping circuit TS4...TS6 is a differential amplifier which is independant of temperature and voltage variations. The video signal of unit 5 is applied to TS4a via terminal 8. Simultaneously the clamping pulses generated in unit 5 are supplied to TS7, via terminal 1.
Because each line is clamped on its back porch by means of the clamping pulses, TS7 will be driven into saturation during this period, so that the same voltage level is obtained on the bases of TS4a and TS4b during blanking.
The clamped video signal is added to the video signal in the adder circuit R1, R2 and C8 (unit 5).
This circuit serves as a 1000–Hz low-pass filter for the clamped video signal and a 1000-Hz high-pass filter for the rest of the video signal, i.e. as a 1000-Hz cross-over filter for both signals.
After this cross-over filter, the video signal is applied to the modulator in unit 7 via modulator buffer amplifier TS1...TS3. This amplifier is of the differential type. R44 is used to adjust the modulator d.c. balance.

Video-meter circuit TS8...TS18 measures the output signal of the modulator buffer amplifier, which is a measure for the modulation depth of the vision modulator.
The amplifiers of this circuit also are of the differential type to ensure stability.
TS8b, TS11, and TS12 amplify a d.c. "reference" voltage (blanking level), while TS8a, TS9 and TS10 amplify the video signal itself. The amplification of each amplifier is 10 dB.
R33 and R28 form part of the negative feedback circuit and ensure constant amplification.
The output voltage of the amplifier is rectified in detector GR3, operating as a peak-to-peak detector (the voltage between GR3 and GR4 is the blanking-to-video peak-value).
GR4 compensates for the voltage drop across GR3. Diodes GR1 and GR2 clamp the output voltage of TS10 to —12 V to protect TS10.

The output current of the peak detector is amplified in meter amplifier TS13...TS18, which is also of the differential type.
This amplifier has a 100% negative voltage feedback and, consequently, only operates as a current amplifier.
Potentiometer R45 serves for setting the meter to zero (electrical zero setting).

Checking and adjusting

Measuring equipment:

Pattern generator	PHILIPS PM 5540
Oscilloscope	e.g. PHILIPS PM 3330
with time base delay-unit	e.g. PHILIPS PM 3347
and Y-amplifier	e.g. PHILIPS PM 3332
DC-voltmeter	e.g. PHILIPS PM 2430

Check and, if necessary, readjust the mechanical zero setting of the vision level meter (ME1).
Mains power to the PM 5590 should be switched off.

Electrical zero setting of the vision level meter

All three buttons "VIDEO" (SK2) should be released. The pointer of ME1 should be in position "0". If not. readjust R45.

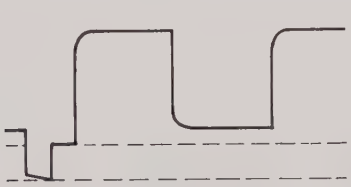
Clamping of the d.c.-level

All three buttons "VIDEO" (SK2) should be released. Set control "VISION IF MODULATION" (R1) to position "0".
Check that the d.c. emitter-level of TS10 is between —11.5 V and —12.0 V. If not, adjust by means of R18.
After this, readjust R44, see unit 7.

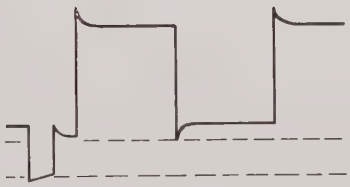
1 kHz cross-over circuit

Apply a 1 V_{p-p} vertical bar video sigal to one of the video inputs (BU2/3–BU9/10–BU14/15), terminate the parallel socket with 75 Ω and depress the corresponding switch "VIDEO" (SK2).
Set control "VISION IF MODULATION" (R1) so that 100% modulation depth is obtained on the vision level meter. Connect the oscilloscope to terminal 16. Trigger externally with frame pulses and make one horizontal line visible with delayed sweep. The oscillogram should be as shown below.

If the following oscillograms appear, readjust with R40 in unit 5.

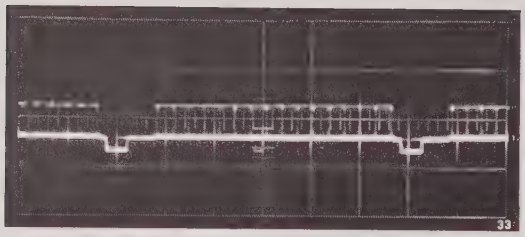


Low frequency emphasis

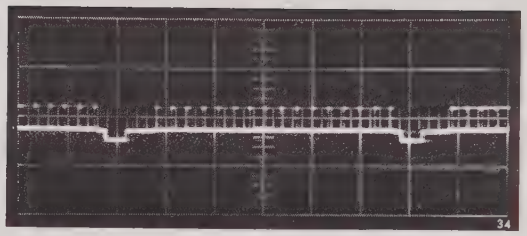


High frequency emphasis

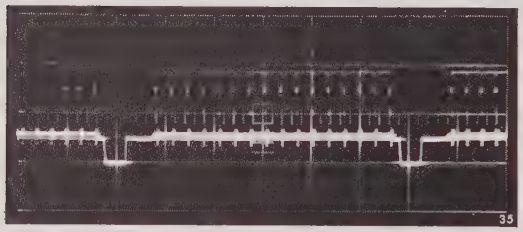
For adjusting R44, refer to the description of unit 7



33. 1 V/cm 10 μs/cm

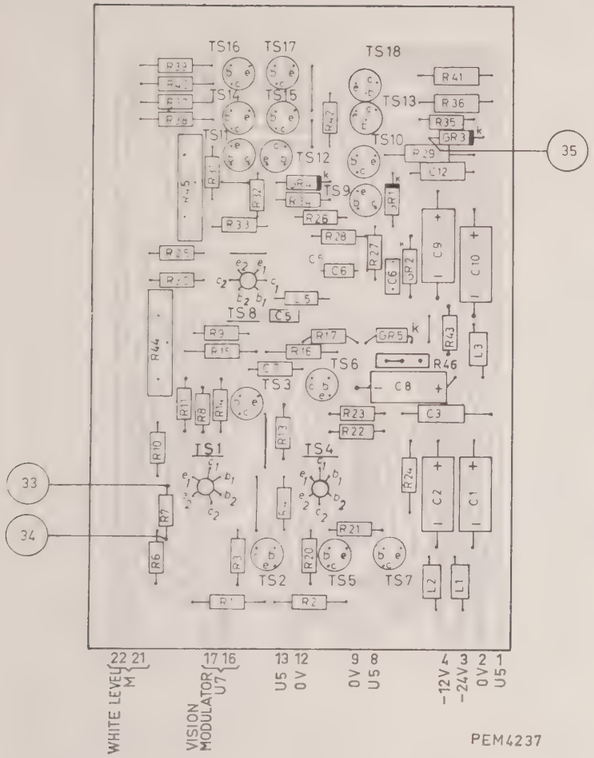


34. 0.5 V/cm 10 μs/cm



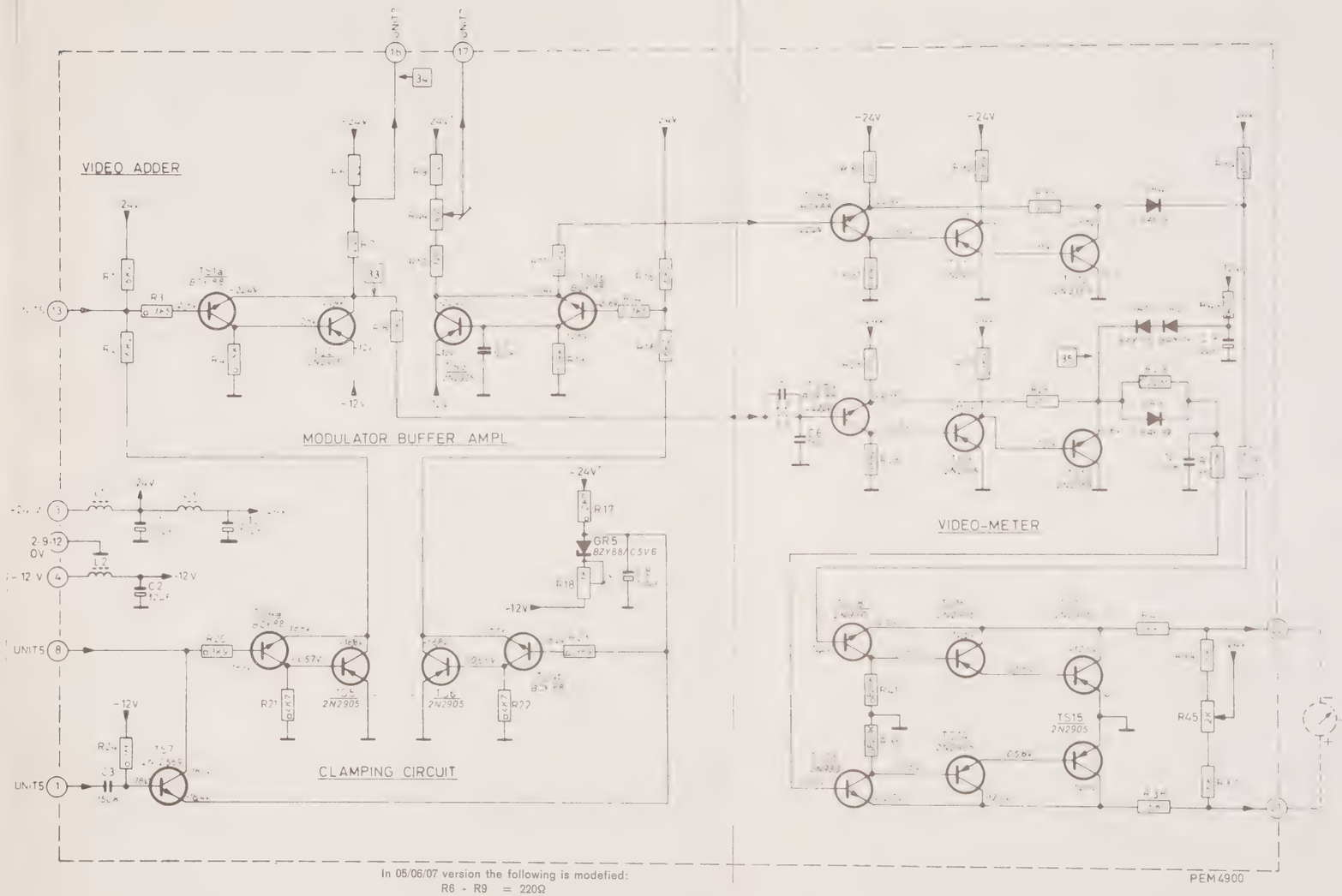
35. 5 V/cm 10 μs/cm

Fig. XII-1 Oscillograms, unit 6



Erratum:
For R46 read R18

Fig. XII-2 Printed wiring board, video clamping and meter circuit, unit 6



In 05/06/07 version the following is modefied:

R6 - R9	=	220Ω
R7	=	120Ω
R10	=	22Ω
R25 - R30	=	1kΩ
R26 - R31	=	6.8kΩ
R28 - R33	=	9009Ω

Fig. XII-3 Circuit diagram, video clamping and meter circuit, unit 6

XIII Unit 7

IF modulators

This unit comprises the modulators for video and sound and the IF oscillator.
The IF oscillator TS3 is a crystal-controlled Colpitts oscillator followed by buffer stage TS4.
The signals for the video and sound modulators as well as for output connector BU5 "IF CARRIER OUT" are taken from three separate amplifier stages TS5 ,TS6 and TS7.
When the instrument should be made suitable for use with an external IF carrier, socket BU5 "IF CARRIER OUT" should be used as input socket for "EXTERNAL IF CARRIER" (see also section VII "Modifications").
The vision modulator is of the ring type.
A balanced ring modulator only modulates the side-bands while the carrier is suppressed.
However, if a suitable d.c. level is added to the "a.c." modulating signal, the modulator output will contain a carrier as well as the side-bands. In case of modulation with TV-signals such a modulator is provided with the correct d.c. component by proper clamping of the TV-signal.
The IF carrier is applied to the ring modulator via TS8 which operates as a driver amplifier.
The video signal is taken from the modulator buffer amplifier in unit 6 (input connections 16 and 17.).
The d.c. balance of the modulator is adjusted by means of R44 in unit 6. The capacitive balance is adjusted by means of C19 or by changing the interconnections from points a–b to c–d or by changing the interconnection of the secondary winding of T7 from c–d to a–b. These interconnections have already been made in the factory.
To make the vision modulator temperature-independent, diodes GR5...GR8 are contained in an oven whose temperature is kept constant.
The oven is heated by resistors R40...R44. By means of NTC resistor R39 and the control circuit in the power supply unit (unit 1), the current through the resistors is controlled so that a constant temperature is obtained.
From the vision modulator the signal is applied to equalizer II in unit 10, via amplifier TS9.

The sound modulator is also of the ring type and is modulated with the frequency modulated sound inter-carrier signal (from unit 8).
Because the carrier is suppressed in a balanced ring modulator, only two side-bands are produced.
Of these two, only the lower side-band is used as the sound IF signal. The upper side-band is cut off in the following band-pass filter (unit 12).
The modulator is balanced by means of R67 in unit 8 (d.c. balancing) and by means of C4 (capacitive balancing).
Interconnections a–b or c–d have been made in the factory.
Transformer T9 ensures balancing of the modulation signal.
From the sound modulator the signal is applied to the IF band-pass filter in unit 12, via amplifier TS2.

Checking and adjusting

Measuring equipment:	
Frequency counter (50 MHz)	e.g. HP 5245 L
Oscilloscope	e.g. PHILIPS PM 3330
with y-amplifier	e.g. PHILIPS PM 3332
TV Pattern generator	e.g. PHILIPS PM 5540
TV Pulse generator	e.g. PHILIPS PM 5530

IF-frequency

Connect the 50 MHz counter to socket "IF CARRIER" (BU5). The frequency should be 38.9 MHz ±200 Hz for A- and E-versions or 39.5 MHz ±200 Hz for B-version. If not, readjust L4.

IF-amplitude

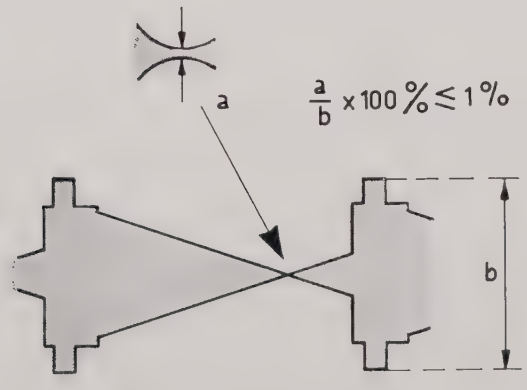
Connect the oscilloscope to socket "IF CARRIER" (BU5), terminated with 75 Ω.
The IF carrier amplitude should be 200 mV ±20%. If not adjust to correct amplitude by means of R46.

Sound IF-modulator:

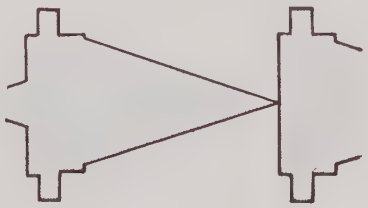
Stop the sound intercarrier oscillator in unit 8 by short-circuiting L3 in unit 8. Connect oscilloscope (40 MHz) to terminal 6 of unit 7 and check that the residual IF carrier is less than 50 mVp-p. If necessary, readjust R67 in unit 8. If desired, a lower residual carrier can possibly be obtained by readjusting C4.

Vision IF-modulator

Apply a 1 V_{p-p} sawtooth-video signal to one of the video inputs (BU2/3–BU9/10–BU14/15), terminate the parallel socket with 75 Ω and depress the corresponding switch "VIDEO" (SK2).
Set control "VISION IF MODULATION" (R1) so that approx. 130% modulation depth is obtained on the vision level meter.
Connect the oscilloscope to socket "VISION IF OUT" (BU7) and terminate this socket with 75 Ω.
Set switch "PHASE PRE DISTORTION" (SK6) to position "OFF".
Check that the modulator residual carrier is less than 1% of the amplitude between sync. pulses, see fig. below.
If not, readjust with C19 (Unit 7 should not be placed on the extension board.)



Set control "VISION IF MODULATION" (R1) so that 0% white level (= 117% modulation depth) is obtained on the vision level meter.
The oscillogram should be as shown below.
If not, readjust R44 in unit 6.



PEM 4228

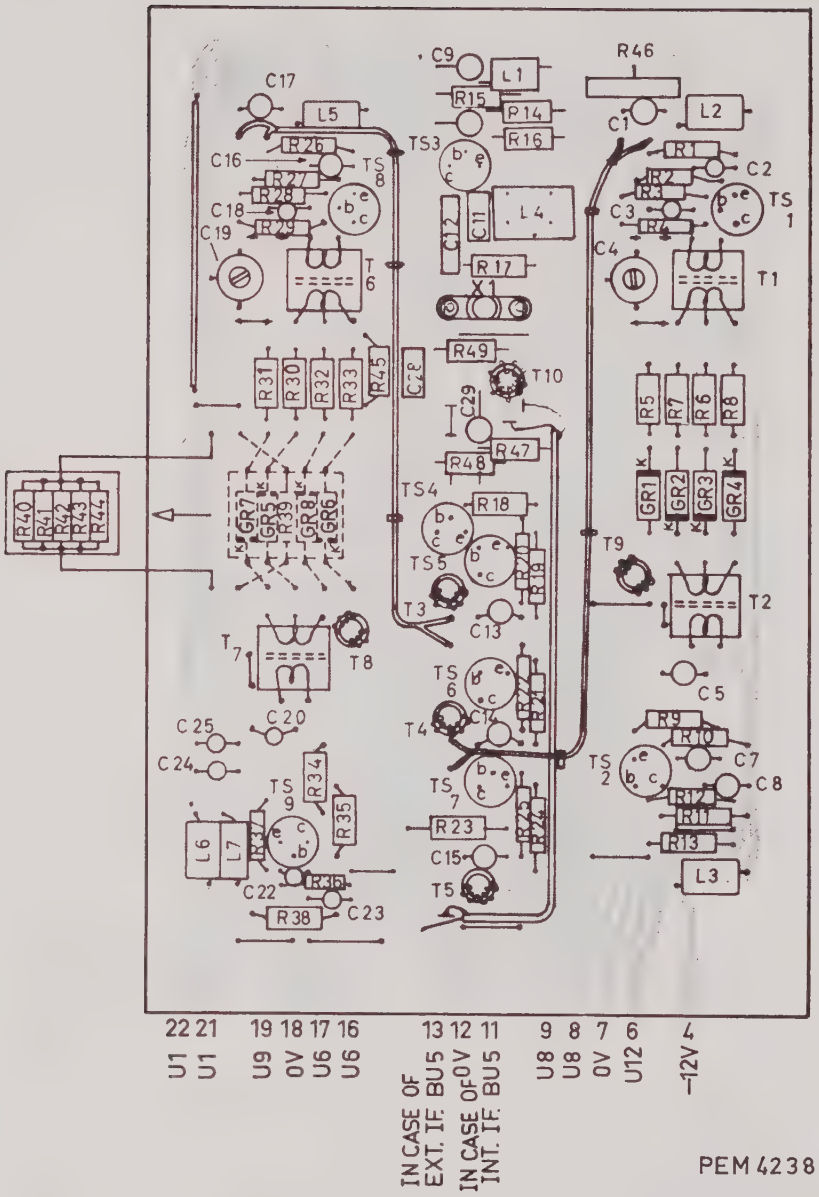
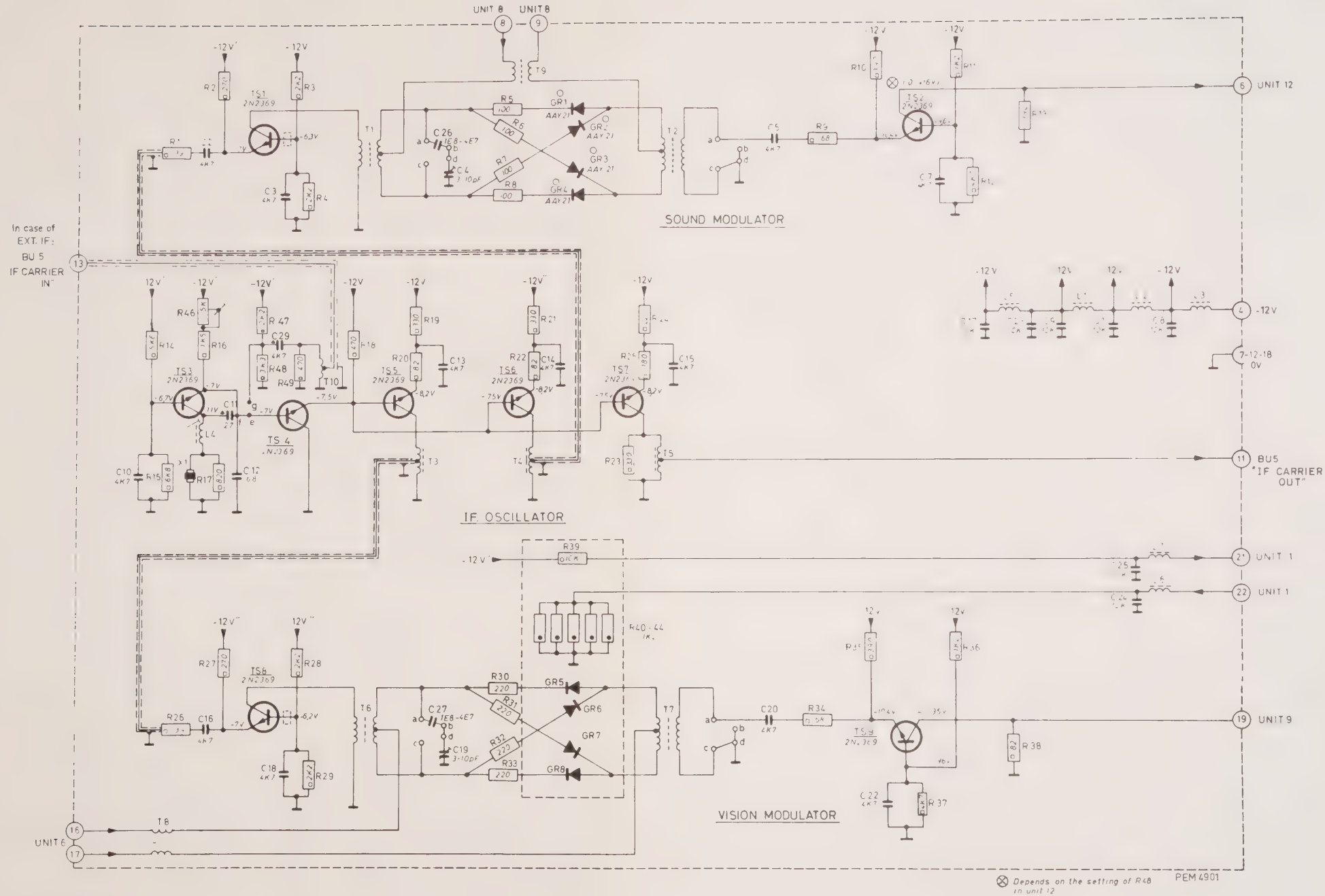


Fig. XIII-1 Printed wiring board, IF modulator, unit 7



⊙ matched diodes, see electrical parts
E/A - version: IF = 38,9 MHz
B - version: IF = 38,5 MHz

INT. IF: CONNECTION BETWEEN POINTS "e" AND "f"
EXT. IF: CONNECTION BETWEEN POINTS "e" AND "g"

In 05/06/07 version the following is modefied:

A resitor of 390Ω - ¼ W - 1% in parallel with a capacitor of 82 pF is connected between T8 and the centre top of T6.

Fig. XIII-2 Circuit diagram, IF modulator, unit 7

XIV Unit 8

Sound inter-carrier oscillator-modulator

This unit consists of an FM oscillator and modulator with amplifiers, and a circuit for controlling the oscillator frequency. The FM oscillator is a Colpitts oscillator. It consists of TS14 and oscillator circuit L3/C23 + C25, C21, C22 and tuning diode GR12. The modulation is effected according to the diode-switching principle. Diode GR13 is conductive for a certain time during each period of the intercarrier signal.
Consequently, the reactive load of the oscillator circuit is dependent on C20 and on the time during which the diode is open.
If diode GR13 is supplied with an LF voltage, the reactive load of the oscillator circuit and, consequently, the oscillator frequency, will vary in accordance with the LF signal, so that frequency modulation is obtained. The frequency sweep is dependent on the amplitude of means of R3 "SOUND IF MODULATION" on the front of the instrument (controls the LF amplitude in unit 3). The mean frequency of the oscillator is controlled by means of a d.c. voltage applied to tuning diode GR12. This d.c. voltage is produced by a frequency control circuit which will be described further on.
Via amplifier TS15–TS16 the oscillator signal is applied to frequency control circuit TS3, etc., and to amplifier TS17–TS18, via potentiometer R2/SK3 ("SOUND IF AMPLITUDE").
The intercarrier signal is applied from this amplifier to the IF modulator (unit 7) and to output connector BU4 ("SOUND INTERCARRIER OUT") The amplification by TS15–TS16 can be adjusted by means of R66.
The frequency control circuit (see also block diagram) consists of the reference oscillator, the mixer, the 70-kHz amplifier and the discriminator. This discriminator supplies, via the d.c. amplifier, the d.c. voltage which controls the oscillator frequency.

Reference oscillator TS1–TS2 is a crystal-controlled oscillator with a frequency 70 kHz more than the intercarrier frequency. Via transistor TS4, the output signal of the oscillator is applied to diode-mixer GR1–GR2.
Simultaneously, the output signal of the intercarrier oscillator is also applied to the diode-mixer via buffer amplifier TS3...TS4.
When the intercarrier oscillator is properly adjusted, the output signal of the mixer (70 kHz), is applied to the discriminator via amplifier TS5...TS7.
Amplifier TS5 is coupled so that the impedance is so high that the mixer is not loaded.
TS6–TS7 is a balanced clipper, transforming the sine-wave output voltage of the detector into a symmetrical squarewave voltage. TS8 is so controlled that it operates in the "on-off" mode. The squarewave output voltage of TS8 is differentiated across C15/C16–R24–R27.
The positive peaks are attenuated to —24 V via GR4. The negative peaks are applied to TS9–TS10.
Diodes GR5–GR6 of the voltage divider provide temperature compensation for TS9 and GR4.
TS9–TS10 (the coupling results in low input impedance and high output impedance) is conductive during the negative peaks, which changes C18 negatively.
The voltage across C18 is proportional to the pulse frequency (the higher the frequency, the higher the voltage, and vice versa). Consequently, it will change, if the frequency of the intercarrier oscillator changes.
Via d.c. amplifier TS11...TS13 (differential amplifier to ensure high stability), this voltage is therefore used to control the frequency of the intercarrier oscillator by means of GR12 (see description of the oscillator).
Diodes GR7...GR10 protect tuning diode GR12 of the oscillator against overloading.

Checking and adjusting

Measuring equipment:

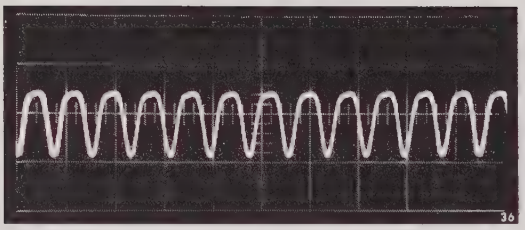
LF Sine wave generator	e.g. PHILIPS PM 5140
LF Voltmeter	e.g. PHILIPS PM 2451
Oscilloscope	e.g. PHILIPS PM 3330
With Y-amplifier	e.g. PHILIPS PM 3332
Frequency counter (6 MHz)	e.g. HP 5245L

Sound intercarrier frequency

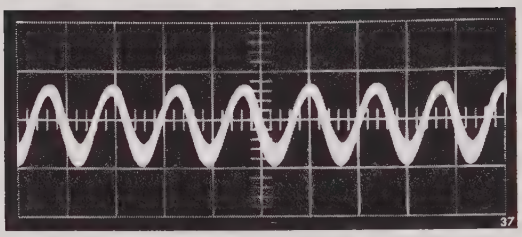
All three buttons "AUDIO" (SK4) should be released. Set control "SOUND IF AMPLITUDE" (R2) to position "2×". Connect socket "SOUND INTERCARRIER" (BU4) to the counter and terminate this socket with 75Ω. The frequency should be 4.5–5.5 or 6.0 MHz ± 500 Hz.
If not, short-circuit diodes GR7...GR10 and readjust L3 so that a frequency of 4.5–5.5 or 6.0 MHz ± 1 kHz is obtained; remove the short-circuit and readjust C16 so that the frequency is 4.5–5.5 or 6.0 MHz ± 100 Hz.

Output level on "SOUND INTERCARRIER" (BU4)

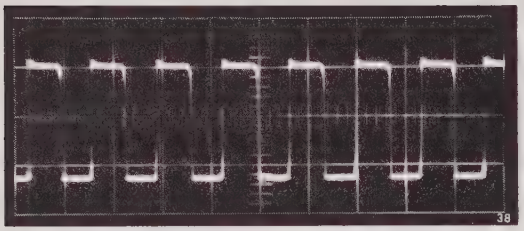
All three buttons "AUDIO" (SK4) should be released. Set control "SOUND IF AMPLITUDE" (R2) to position "NOM". Connect socket "SOUND INTERCARRIER" (BU4) to the oscilloscope and terminate this socket with 75Ω. The signal amplitude should be 280 mV_{p-p} ± 20%. If not, readjust R66. After this, readjust the sound i.f. modulator balance (R67) see Unit 7. For adjusting R67, refer to description of unit 7.



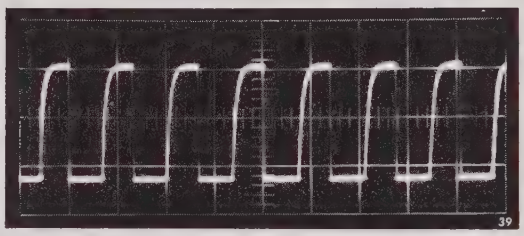
36. 2 V/cm 0.2 µs/cm



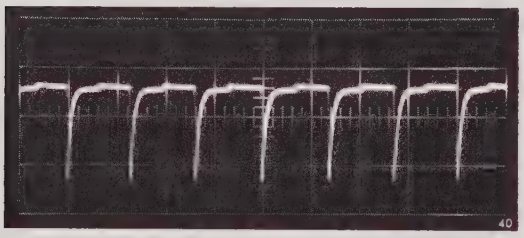
37. 0.5 V/cm 10 µs/cm



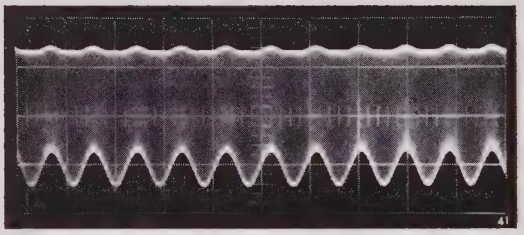
38. 0.5 V/cm 10 µs/cm



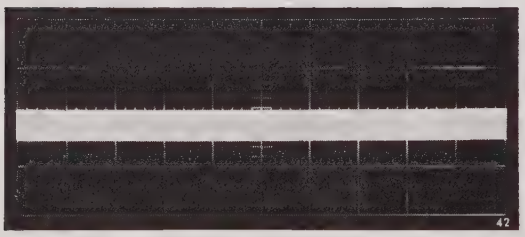
39. 10 V/cm 10 µs/cm



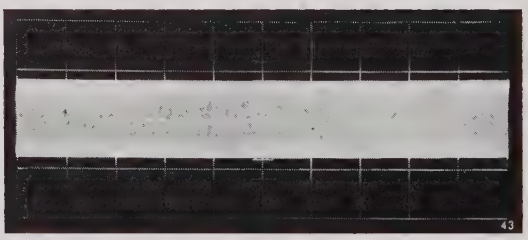
40. 10 V/cm 10 µs/cm



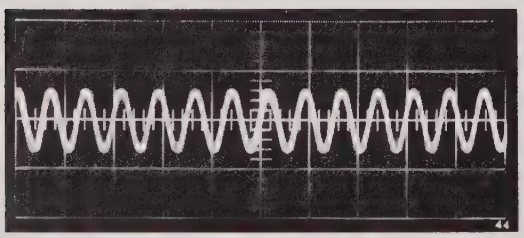
41. 1 V/cm 1 ms/cm



42. 0.5 V/cm 1 ms/cm



43. 0.5 V/cm 1 ms/cm



44. 0.5 V/cm 0.2 µs/cm

Fig. XIV-1 Oscillograms, unit 8

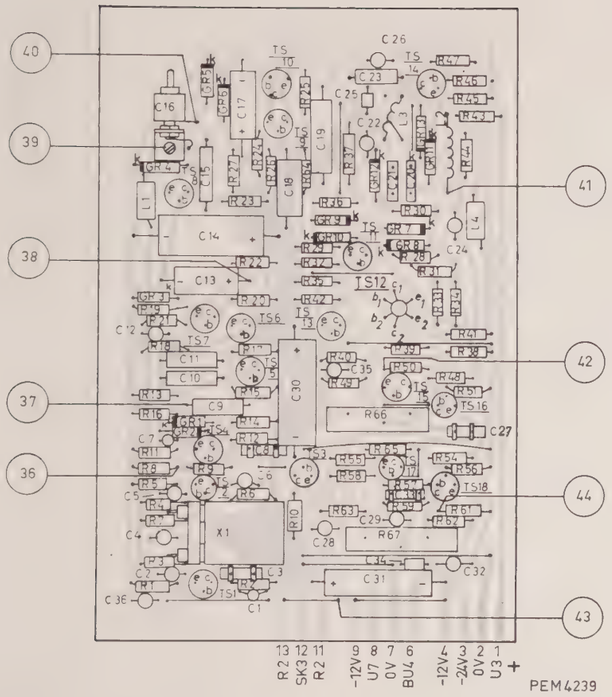


Fig. XIV-2 Printed wiring board, sound inter-carrier-oscillator modulator, unit 8

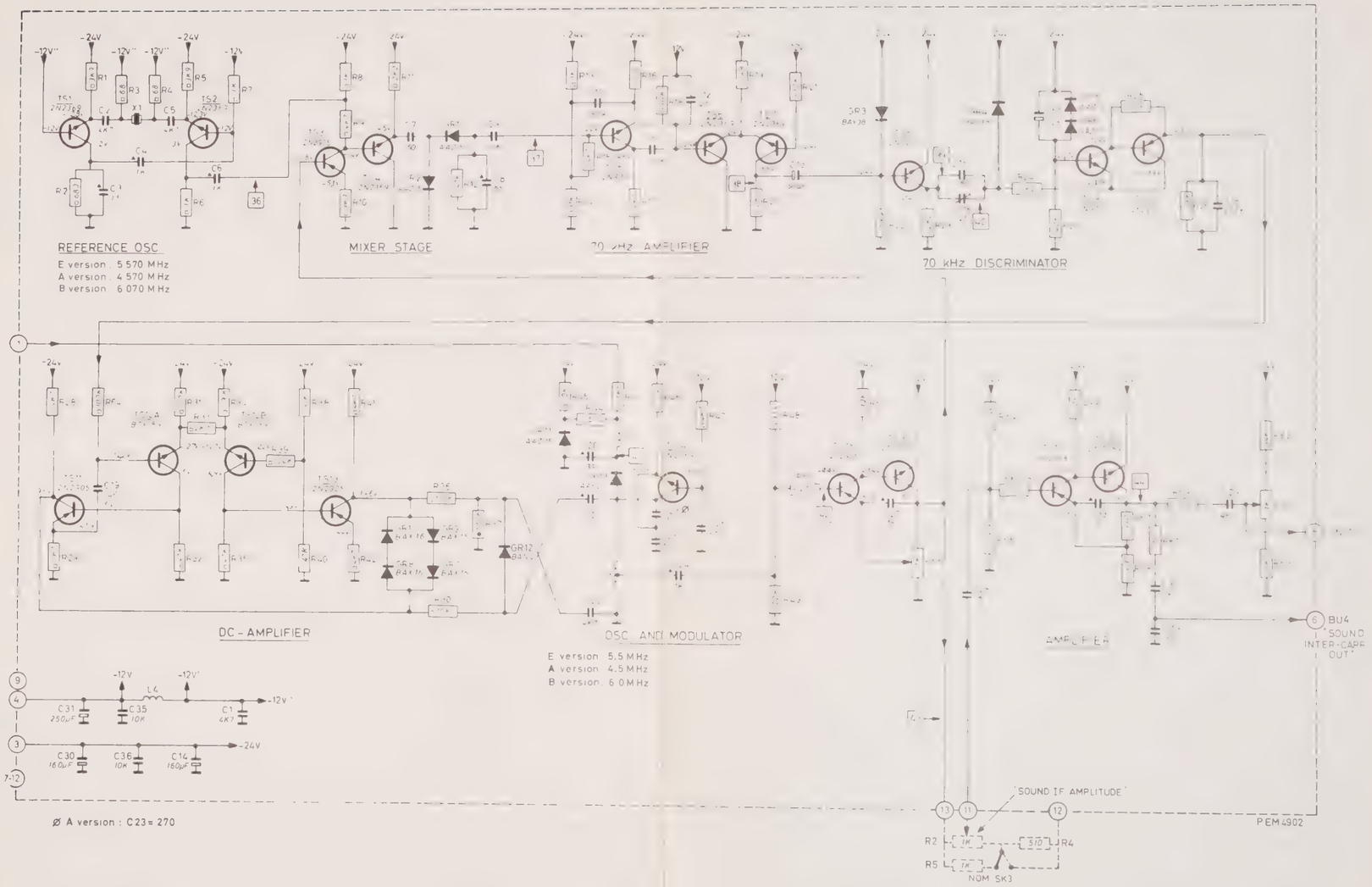


Fig. XIV-3 Circuit diagram, sound intercarrier-oscillator modulator, unit 8

XV Units 9 and 10

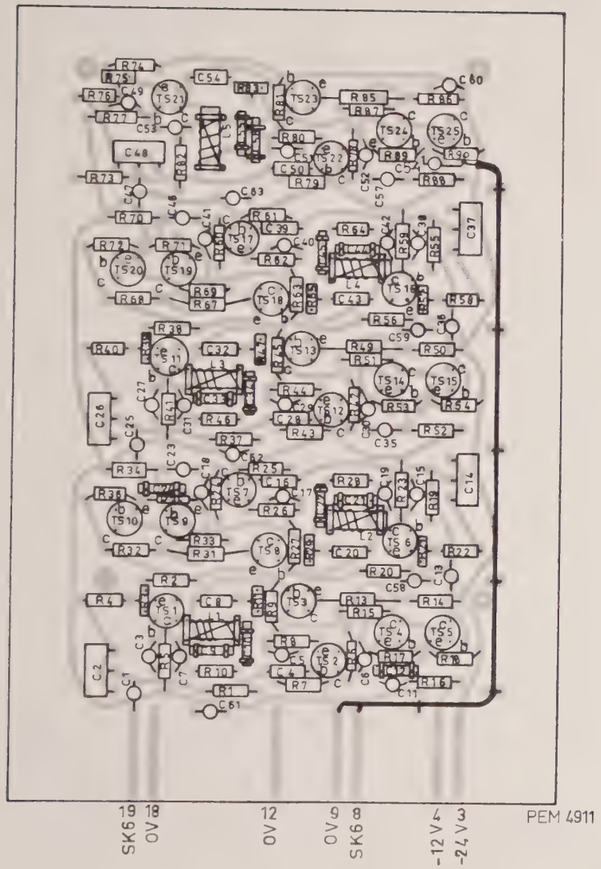
Equalizers I and II

The generator is provided with two equalizers: units 9 and 10. Equalizer II (unit 10) serves to correct phase errors introduced by the following vestigial side-band filter (unit 11).

Equalizer I, which can be connected in series with equalizer II with switch SK6, can introduce a phase pre-distortion (see Fig. II-1).

Each equalizer consists of five identical sections, and an isolating stage between the equalizers.

Note: In case of doubt concerning the performance of the circuits of units 9 and 10, it is advisable to return the complete PM 5590 to our laboratories for repairs after consultation with the local PHILIPS representative.



N.B. The electrical zero is connected to the copper screen which is not showing on the drawing

Fig. XV-1 Printed wiring board, equalizer 1, unit 9

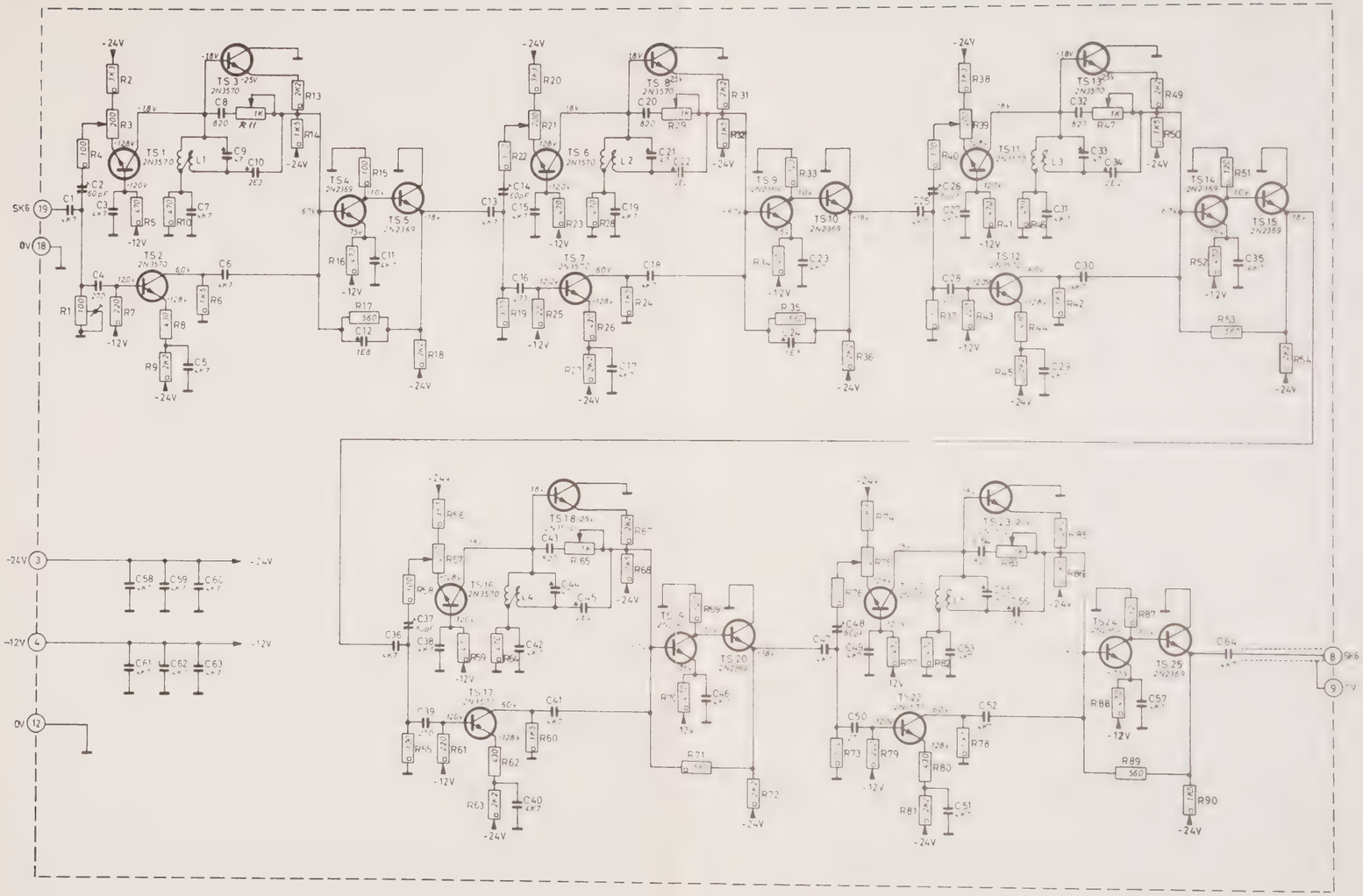
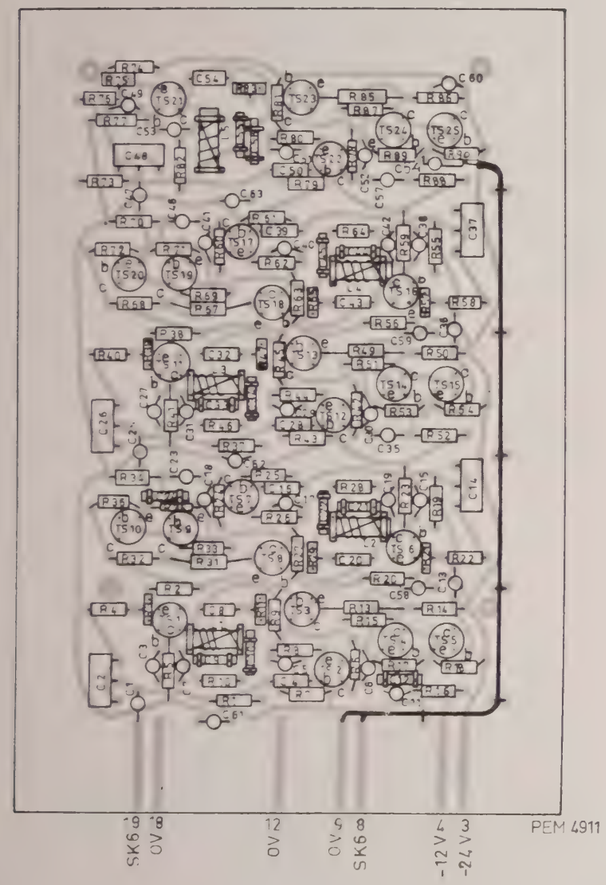


Fig. XV-2 Circuit diagram, equalizer I, unit 9



N.B. The electrical zero is connected to the copper screen which is not showing on the drawing

Fig. XV-3 Printed wiring board, equalizer II, unit 10

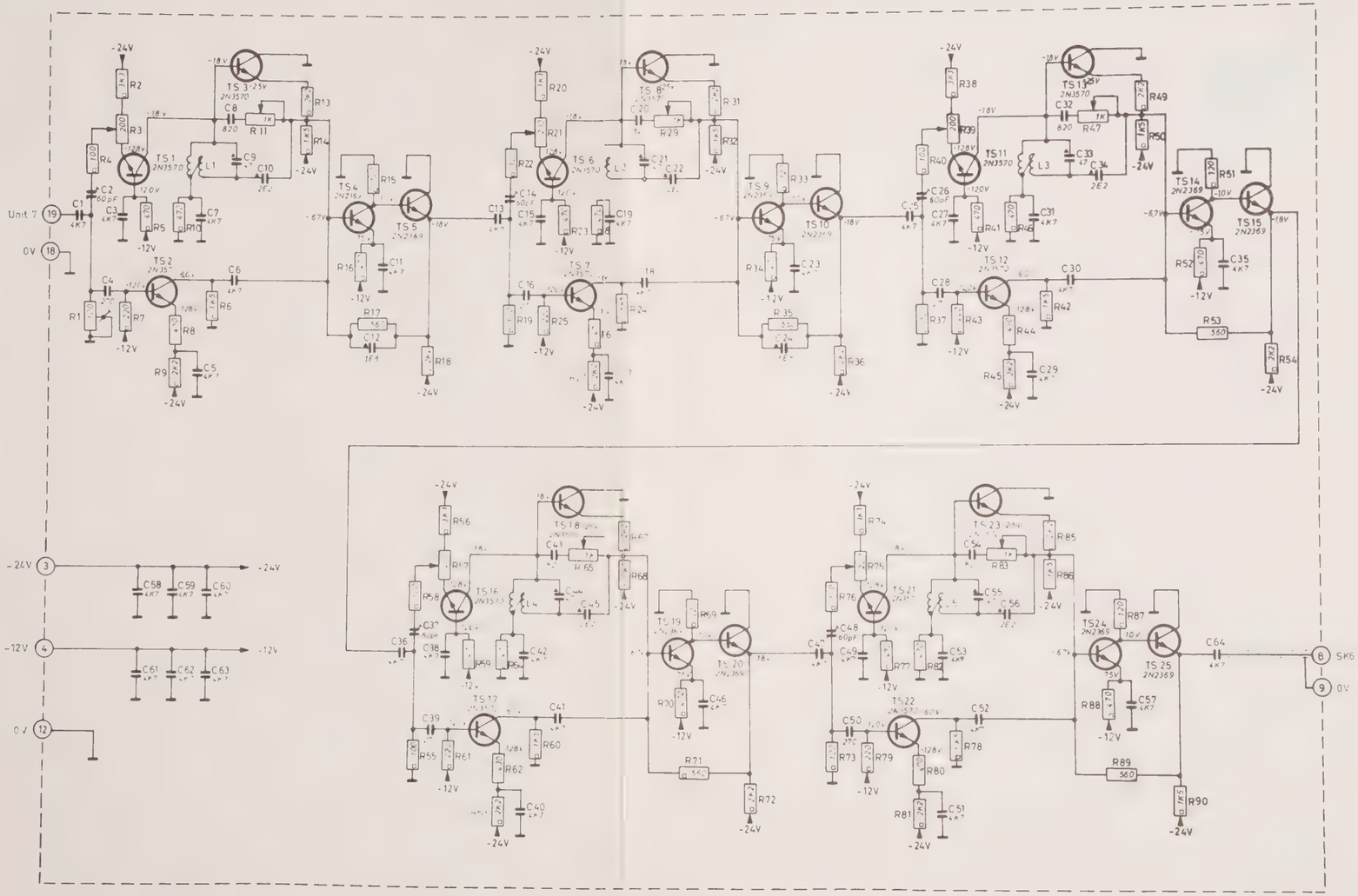


Fig. XV-4 Circuit diagram, equalizer II, unit 10

XVI Unit 11

Vestigial side-band filter

The modulated IF signal is passed through a vestigial side-band filter. This filter limits the frequency range of the signal so that the lower side-band is transmitted with a band-width of 4.2–5.0 or 5.5 MHz and the upper side-band is limited to approx. 0.75 or 1.25 MHz.
The specifications for this filter are extremely high. The pass-band has to be very flat, and the cut-off very steep.
These filter properties have been achieved by combining three band-filter sections. The design of the first and second filter is identical. The first filter consists of circuits L2–C7 and L5–C10, coupled by means of two trap circuits (L3–C8 and L4–C9).

The second filter (L6–C15, L7–C16, L8–C17, L9–C18) is identical to the first one.
The third filter (L10–C23' L11–C26) is a normal capacitively-coupled band-filter. The coupling is roughly above critical. By combining this filter with the preceding two, an extremely flat frequency response is obtained.
This unit also comprises part of the output amplifier. The collector signal of TS4 is applied to amplifier TS6... TS8 and inverter TS5.
TS8 supplies the modulated vision IF signal to connector BU7 ("VISION IF OUT").
The collector signal of TS5 is applied to the output amplifier in unit 12, where it is combined with the sound IF signal.

Checking and adjusting

Measuring equipment:
Oscilloscope e.g. PHILIPS PM 3330
with 50 MHz Y-amplifier e.g. PHILIPS PM 3332

Carrier level on "VISION IF OUT" (BU7)

Set control "SOUND IF AMPLITUDE" (R2) to position "0".
Set control "VISION IF MODULATION (R1) to position "0".
Connect the oscilloscope to socket "VISION IF OUT" (BU7) and terminate this socket with 75 Ω.
The vision carrier level should be 420 $mV_{p-p} \pm 20\%$.
If not, readjust R37.

Note: In case of doubt concerning the performance of the circuits of unit 11, it is advisable to return the complete PM 5590 to our laboratories for repairs after consultation with the local PHILIPS representative.

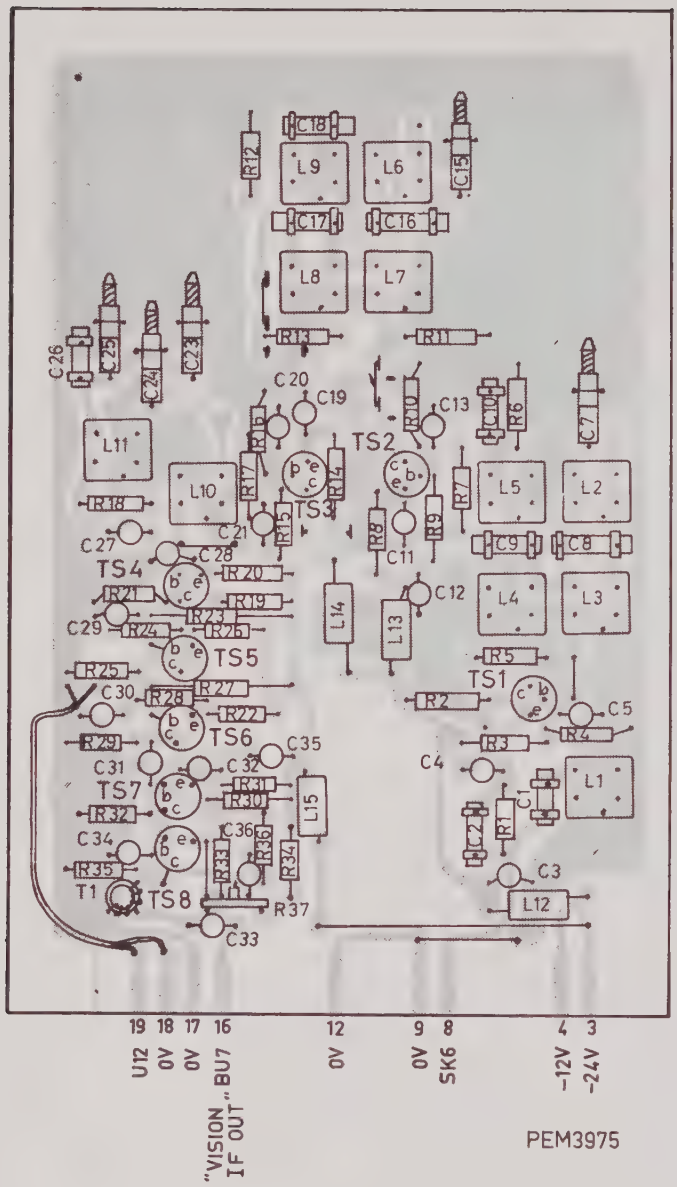
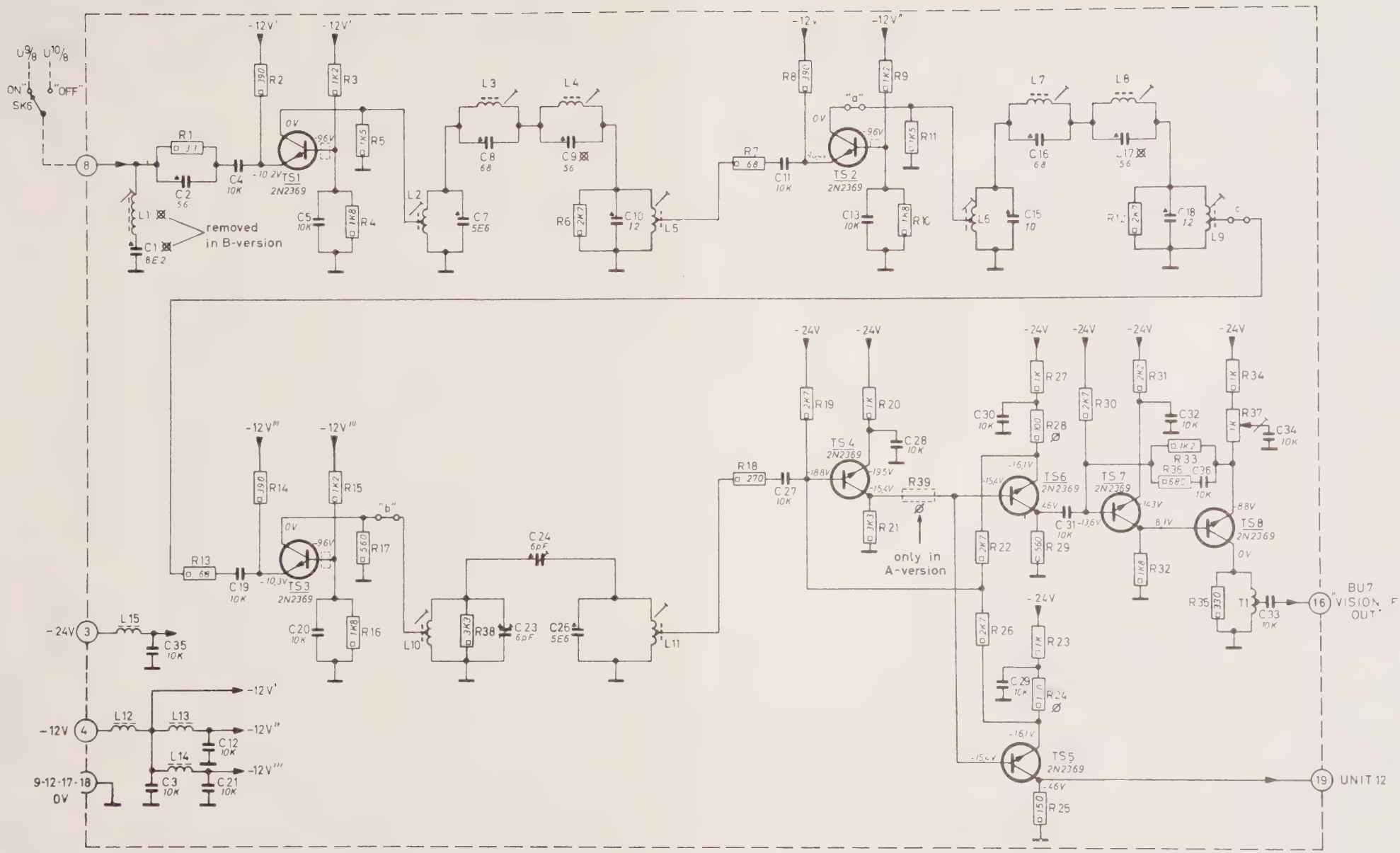


Fig. XVI-1 Printed wiring board, vestigial side-bandfilter, unit 11



Ø only in A-version: R6 = 3.9 kΩ
R12 = 4.7 kΩ
R24 = 220Ω
R28 = 220Ω
R39 = 56Ω
only in E-version R38 = 6.8 kΩ
C7 = 3.9 pF
C15 = 6.8 pF

⊠ only in B version:
L1/C1 removed.
C9 = 10 pF
C17 = 10 pF

Fig. XVI-2 Circuit diagram, vestigial side-band filter, unit 11

XVII Unit 12

Output amplifier

This unit comprises an IF band-pass filter for the sound IF signal as well as a number of amplifiers for the video and sound output signals.

The IF band-pass filter

As already stated, two side-bands are produced in the ring modulator of the sound modulator.
The upper one has to be cut off by the band-pass filter (A-version: 34.4 MHz; B-version: 33.5 MHz and E-version: 33.4 MHz)
This filter consists of circuits L3–C19 and L4–C22 which are coupled via C20.
The signal is applied to the filter via TS7.
The signal amplitude is adjustable by means of R48.
The sound and the video IF signal are applied together to output connector BU11 ("IF I OUT") and BU12, ("IF II OUT") via the output amplifiers in unit 13. The sound IF signal is applied to output connector BU6 ("SOUND IF OUT"). Two split amplifiers have also been provided to ensure correct distribution of the signals.
Via sound split amplifier I (TS8–TS9–TS10) and sound output amplifier TS11–TS12, the sound IF signal of the band-pass filter is applied to output connector BU6 ("SOUND IF OUT").
The amplification of the output amplifier is adjustable by means of R49.
Transformer T5 serves to adjust the output impedance of the output amplifier to 75Ω, T6 is a balancing transformer to prevent radiation from the cable connection to BU6.
Via sound split amplifiers I and II the sound signal is distributed to the output amplifiers TS5 and TS6. Via the output circuits of these amplifiers (from T3 and T4 respectively), the sound IF signal, together with the video IF signal, (from T1 and T2 respectively), are applied to the output amplifiers in unit 13.
Video split amplifier TS1 distributes the video IF signal to the two output amplifiers TS2 and TS3, from where the video IF signal, together with the sound IF signal, is applied to unit 13.
The amplification by the video output amplifiers TS2–TS3 is adjustable by means of potentiometers R50 and R51 respectively.
Transformers T1...T4 serve to adjust the output impedance of the output amplifiers to 50Ω.

Checking and adjusting

Measuring equipment:

Oscilloscope	e.g. PHILIPS PM 3330
with 50 MHz-Y-amplifier	e.g. PHILIPS PM 3332

Sound carrier level on "IF I OUT" (BU11) and "IF II OUT" (BU12)

Set control "SOUND IF AMPLITUDE" (R2) to position "NOM".
Set control "SOUND IF MODULATION" (R3) to position "0".
Remove unit 10 (Equalizer II) from the PM 5590.
Terminate both "IF I OUT" and "IF II OUT" with 50Ω.
Check that the signal level on both sockets is 900 mV_{p-p} ±20%.
If not, readjust R48. After this, readjust R49, see next check.

Carrier level on "SOUND IF OUT" (BU6)

Set control "SOUND IF AMPLITUDE (R2) to position "NOM".
Set. control "SOUND IF MODULATION" (R3) to position "0".
Remove unit 10 (Equalizer II) from the PM 5590.
Connect the oscilloscope to socket "SOUND IF OUT" (BU6) and terminate this socket with 75Ω. The sound carrier level should be 200 mV_{p-p} ±20%.
If not, readjust R49.

Vision carrier level on "IF I OUT" (BU11) and "IF II OUT" (BU12)

Set control "SOUND IF AMPLITUDE" (R2) to position "0".
Set control "VISION IF MODULATION" (R1) to position "0".
Insert unit 10 (Equalizer II) again.
Terminate both "IF OUT" and "IF II OUT" with 50Ω.
Check that the signal level on both sockets is 2100 mV ±20. If not, readjust with R50 for "IF II OUT" and with R51 for "IF I OUT".

Note: In case of doubt concerning the performance of the circuits of unit 12, it is advisable to return the complete PM 5590 to our laboratories for repairs after consultation with the local PHILIPS representative.

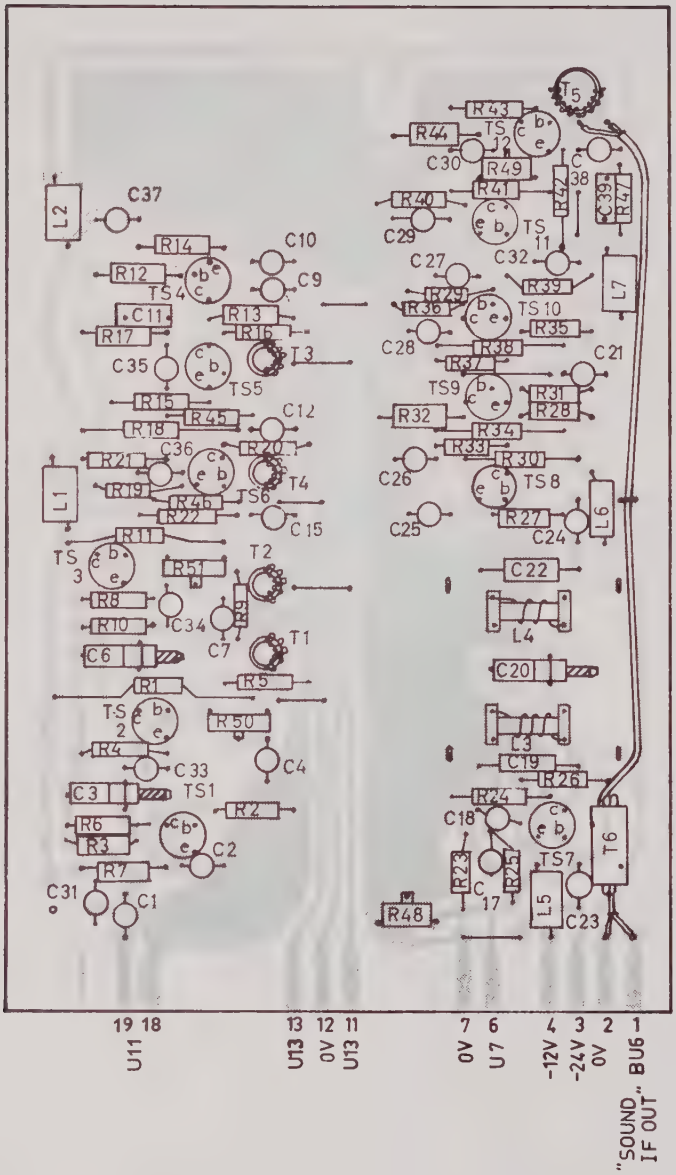
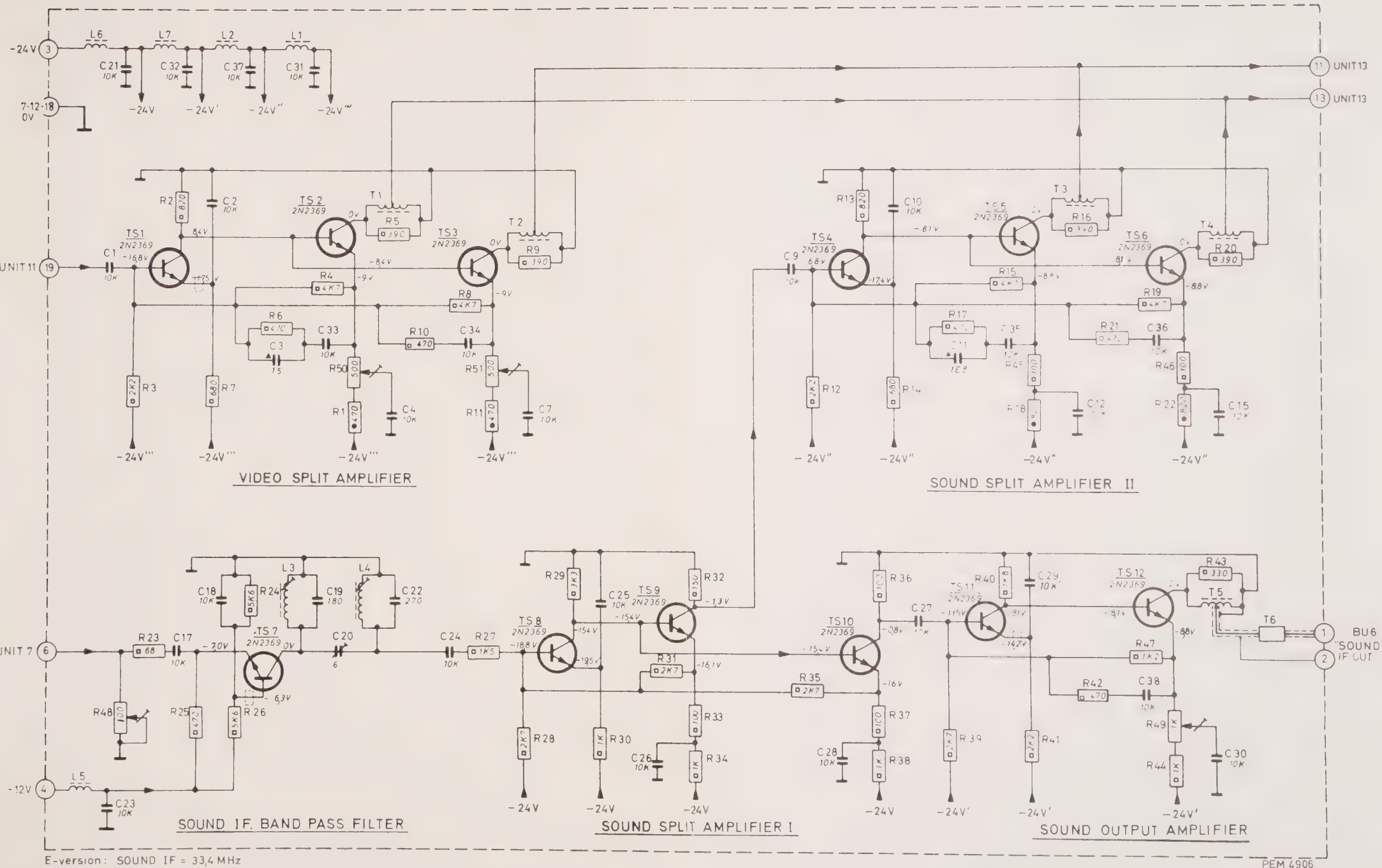


Fig. XVII-1 Printed wiring board, output amplifier, unit 12



E-version: SOUND IF = 33,4 MHz
A-version: SOUND IF = 34,4 MHz
B-version: SOUND IF = 33,5 MHz

Fig. XVII-2 Circuit diagram, output amplifier, unit 12

XVIII Unit 13

Connection board and IF output amplifiers

Apart from the looping-through facilities with the connections on the rear of the instrument, this unit also contains two separate output amplifiers for the complete IF signal.
The two output amplifiers are identical. The amplification is 15 dB in the range of 30...40 MHz.
The transistors are d.c. coupled, the Zener diode enables d.c. coupling between the two transistors in spite of the voltage difference. The amplifiers have a negative current feedback via R12–C11 and R4–C2 Transformer T1 (T2) is used to adjust the output impedance to 50 Ω. Output filter L4–C5–L6–C7 (L5–C14–L7–C15) serves to attenuate the second harmonic of the intermediate frequency, and also ensures correct output impedance.
Capacitors C19–C20 (C21–C22) serve to prevent 50 Hz hum currents on the IF cables from i.a. penetrating the instrument.
The output level is 1 V into 50 Ω.

Note: In case of doubt concerning the performance of the circuits of unit 13, it is advisable to return the complete PM 5590 to our laboratories for repairs after consultation with the local PHILIPS representative.

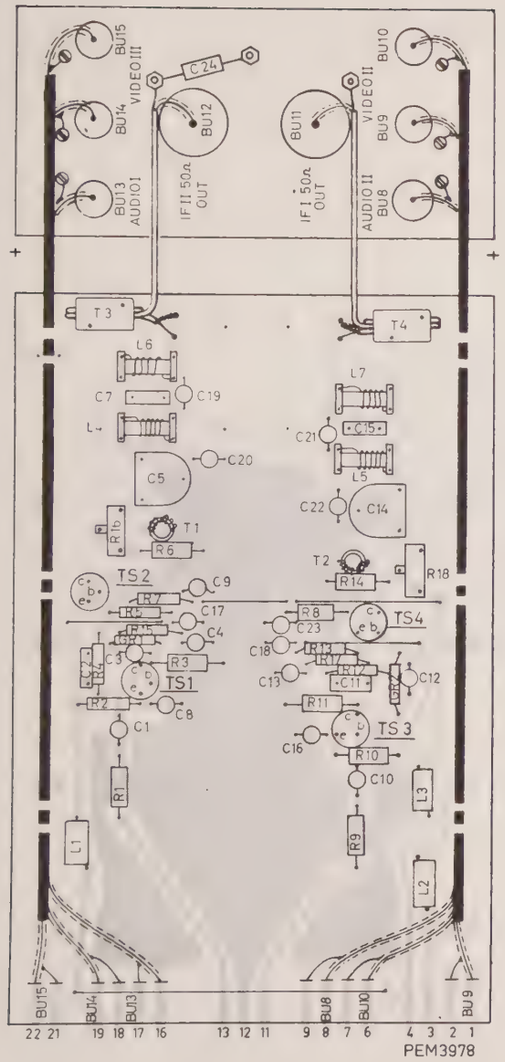


Fig. XVIII-1 Printed wiring board, connection board and IF output amplifiers, unit 13

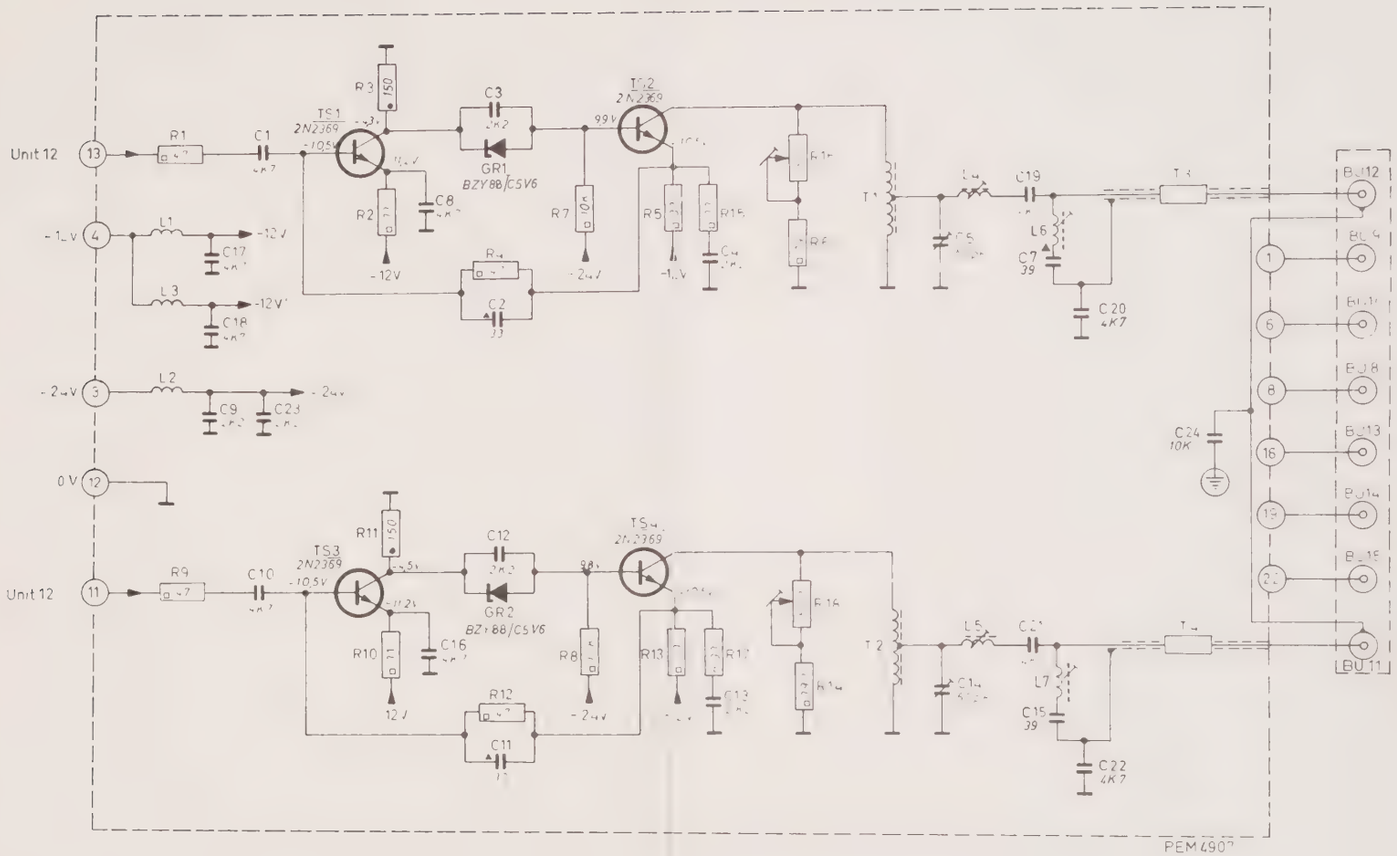


Fig. XVIII-2 Circuit diagram, connection board and IF output amplifiers, unit 13

XIX Access to and replacement of parts

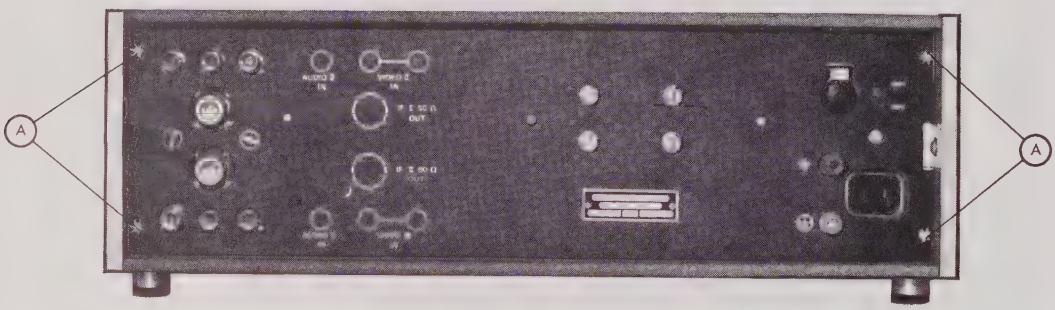


Fig. XIX-1 Rear view

A. Removing the cabinet panels

The cabinet consists of a number of panels which can be removed separately.

1. Rear panel
   a. Loosen the 4 screws "A" (see fig. XIX-1) and the 2 screws near the "IF OUT" sockets.
   b. Remove the rear plate
2. Top panel
   a. Pull the springs, at the rear corners of the panel, while lifting the rear of the panel
   b. Push the panel forward and remove it.
3. Bottom panel
   a. Place the instrument upside down
   b. Remove the 4 feet
   c. Pull the springs, at the rear corners of the panel, while lifting the rear of the panel
   d. Push the panel forward and remove it.

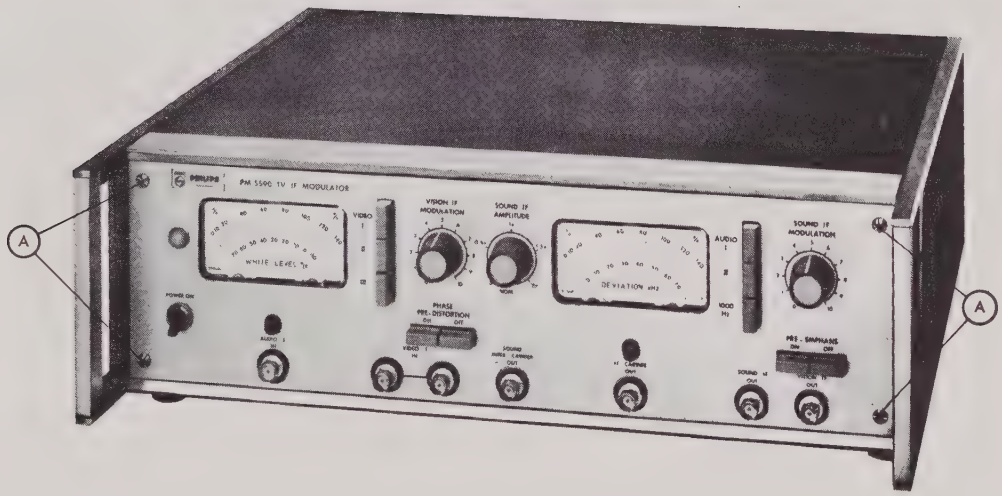


Fig. XIX-2 Front view

B. Removing the front panel

a. Loosen the 4 screws "A" (see fig. XIX-2).
b. Pull the plate, placed on a slide, forward and turn it down.
The front panel components are now accessible.

XX Maintenance

A. Switches

Should the switches cease to function properly due to dirty contacts, they can be treated with switch oil (see list of mechanical parts).
This oil has both cleaning and lubricating properties.
After using this oil, the switch should be operated a few times.

B. Cabinet panels

If the cabinet panels, covered with polyvinylchloride, become dirty, they can be washed with soap and water (first remove the panel from the casing, chapter XIX).
If necessary, fine scouring powder can be used.

XXI List of mechanical parts

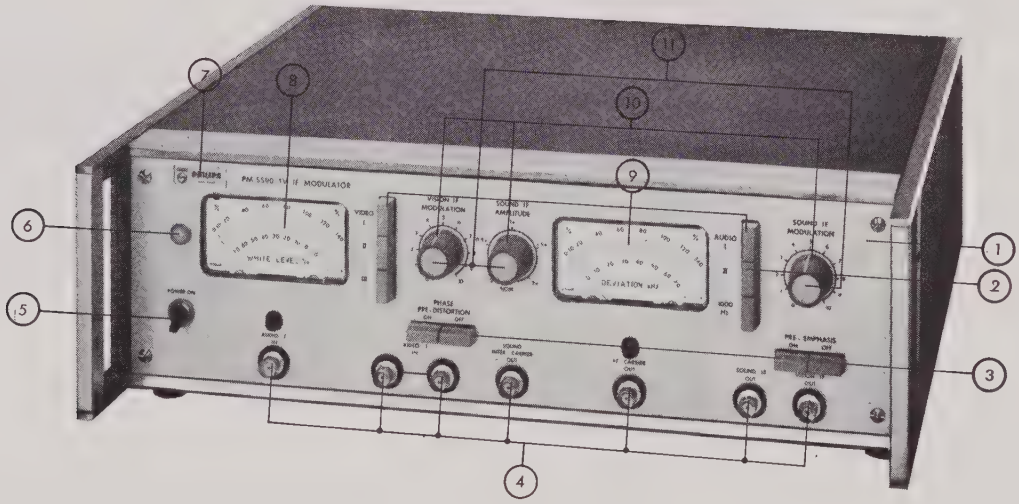


Fig. XXI-1 Front view

Item	*Description*	*Quant.*	*Ordering number*
1	Text plate	1	4822 455 90296
2	Push button unit	1	4822 276 30131
3	Push button unit	1	4822 276 20076
4	BNC connector	7	4822 267 10004
5	Switch	1	4822 277 10021
6	Lampholder	1	4822 255 10025
7	Badge	1	4822 459 10086
8	Measuring instrument 250 mA	1	4822 347 20051
9	Measuring instrument 250 mA	1	4822 347 20052*
10	Knob	3	4822 413 40211
11	Cap for knob	3	4822 413 70037

* Only for B- and E-version; ordering number for A-version on request

Item	Description	Quant	Ordering number
12	BNC connector	6	4822 267 10022
13	N. connector	2	4822 266 10014
14	Earth connector	1	4822 290 40011
15	Earth connector	1	4822 290 40012
16	Socket (mains con.) (3-pole)	1	4822 265 30058
17	Switch	1	4822 277 20014
18	Fuse holder	1	4822 256 40012
19	Adapter for spindle of R2	1	4822 532 20158
	Contact block	1	4822 267 70043
	BNC connector (cable part)		4822 265 10003

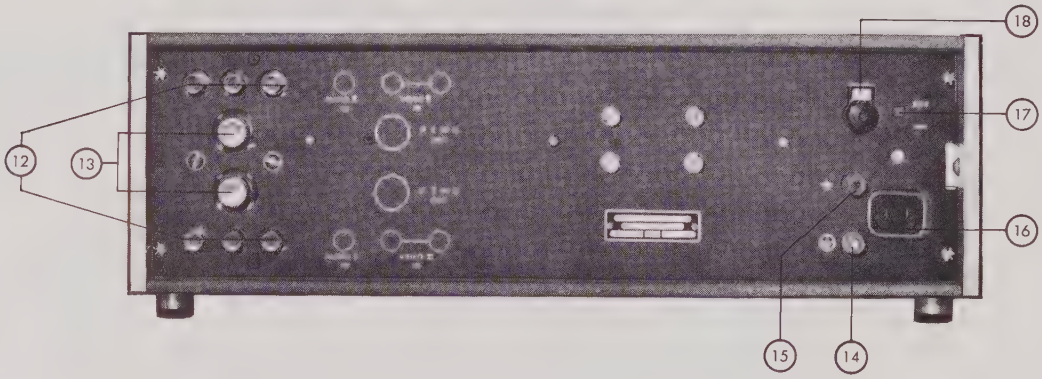


Fig. XXI-2 Rear view

Terminating plug (75 Ω)	4822 264 10024
Coaxial cable (75 Ω)	4822 320 10028
N-connector (cable part)	4822 264 10019
Terminating plug (50 Ω)	4822 263 60026
Coaxial cable (50 Ω)	4822 320 10021
Mains flex	4822 321 10071
Mains plug (female) 3-pole)	4822 266 30057
Fuse for 230 V operation	4822 253 30021
Fuse for 115 V operation	4822 253 30019
10 cc of switch oil	4822 390 10007

XXII List of electrical parts

This parts list does not contain multi-purpose and standard parts. These components are indicated in the circuit diagram by means of identification marks. The specification can be derived from the survey below.

Diese Ersatzteilliste enthält keine Universal- und Standard-Teile. Diese sind im jeweiligen Prinzipschaltbild mit Kennzeichnungen versehen. Die Spezifikation kann aus nachstehender Übersicht abgeleitet werden.

In deze stuklijst zijn geen universele en standaardonderdelen opgenomen. Deze componenten zijn in het principeschema met een merkteken aangegeven. De specificatie van deze merktekens is hieronder vermeld.

La présente liste ne contient pas des pièces universelles et standard. Celles-ci ont été repérées dans le schéma de principe. Leurs specifications sont indiquées ci-dessous.

Esta lista de componentes no comprende componentes universales ni standard. Estos componentes están provistos en el esquema de principio de una marca. El significado de estas marcas se indica a continuación.

Carbon resistor E24 series
Kohleschichtwiderstand, Reihe E24
Koolweerstand E24 reeks
Résistance au carbone, série E24
Resistencia de carbón, serie E24

0,125 W 5%

Carbon resistor E12 series
Kohleschichtwiderstand, Reihe E12
Koolweerstand E12 reeks
Résistance au carbone, série E12
Resistencia de carbón, serie E12

1 W ≦ 2,2 MΩ, 5%
> 2,2 MΩ, 10%

Carbon resistor E12 series
Kohleschichtwiderstand, Reihe E12
Koolweerstand E12 reeks
Résistance au carbone, série E12
Resistencia de carbón, serie E12

0,25 W ≦ 1 MΩ, 5%
> 1 MΩ, 10%

Carbon resistor E12 series
Kohleschichtwiderstand, Reihe E12
Koolweerstand E12 reeks
Résistance au carbone, série E12
Resistencia de carbón, serie E12

2 W 5%

Carbon resistor E24 series
Kohleschichtwiderstand, Reihe E24
Koolweerstand E24 reeks
Résistance au carbone, série E24
Resistencia de carbón, serie E24

0,5 W ≦ 5 MΩ, 1%
> 5 ≦ 10 MΩ, 2%
> 10 MΩ, 5%

Wire-wound resistor
Drahtwiderstand
Draadgewonden weerstand
Résistance bobinée
Resistencia bobinada

0,4 – 1,8 W 0,5%

Carbon resistor E12 series
Kohleschichtwiderstand, Reihe E12
Koolweerstand E12 reeks
Résistance au carbone, série E12
Resistencia de carbón, serie E12

0,5 W ≦ 1,5MΩ, 5%
> 1,5MΩ, 10%

Wire-wound resistor
Drahtwiderstand
Draadgewonden weerstand
Résistance bobinée
Resistencia bobinada

5,5 W ≦ 200 Ω, 10%
> 200 Ω, 5%

Wire-wound resistor
Drahtwiderstand
Draadgewonden weerstand
Résistance bobinée
Resistencia bobinada

10 W 5%

Tubular ceramic capacitor
Rohrkondensator
Keramische kondensator, buistype
Condensateur céramique tubulaire
Condensador cerámico tubular

500 V

Polyester capacitor
Polyesterkondensator
Polyesterkondensator
Condensateur au polyester
Condensador polyester

400 V

Tubular ceramic capacitor
Rohrkondensator
Keramische kondensator, buistype
Condensateur céramique tubulaire
Condensador cerámico tubular

700 V

Flat-foil polyester capacitor
Miniatur-Polyesterkondensator (flach)
Platte miniatuur polyesterkondensator
Condensateur au polyester, type plat
Condensador polyester, tipo de placas planas

250 V

Ceramic capacitor, "pin-up"
Keramikkondensator "Pin-up" (Perltyp)
Keramische kondensator "Pin-up" type
Condensateur céramique, type perle
Condensador cerámico, versión "colgable"

500 V

Paper capacitor
Papierkondensator
Papierkondensator
Condensateur au papier
Condensador de papel

1000 V

"Microplate" ceramic capacitor
Miniatur-Scheibenkondensator
"Microplate" keramische kondensator
Condensateur céramique "microplate"
Condensador cerámico "microplaca"

30 V

Wire-wound trimmer
Drahttrimmer
Draadgewonden trimmer
Trimmer à fil
Trimmer bobinado

Mica capacitor
Glimmerkondensator
Micakondensator
Condensateur au mica
Condensador de mica

500 V

Tubular ceramic trimmer
Rohrtrimmer
Buisvormige keramische trimmer
Trimmer céramique tubulaire
Trimmer cerámico tubular

For multi-purpose and standard parts, please see PHILIPS' Service Catalogue.
Für die Universal- und Standard-Teile siehe den PHILIPS Service-Katalog.
Voor universele en standaardonderdelen raadplege men de PHILIPS Service Catalogus.
Pour les pièces universelles et standard veuillez consulter le Catalogue Service PHILIPS.
Para piezas universales y standard consulte el Catálogo de Servicio PHILIPS.

PRINT PANELS

E-version

Unit	*Description*	*Print number*	*Ordering number*
1	Power supply	4008 108 74810	4822 212 70138
2	Extension board	4008 108 70920	4822 466 10132
3	100 Hz oscillator and LF pre-amplifier	4008 108 73150	4822 212 70098
4	LF peak level meter	4008 108 74590	4822 212 70139
5	Video amplifier-clamping generator circuit	4008 108 74601	4822 212 70141
6	Video clamping and meter circuit	4008 108 75630	4822 212 70142
7	IF modulators	4008 107 74620	4822 212 70143
8	Sound inter-carrier oscillator modulator	4008 108 74630	4822 212 70144
9	Equalizer I	4008 108 74640	4822 212 70145
10	Equalizer II	4008 108 74650	4822 212 70146
11	Vestigial side band filter	4008 108 74660	4822 212 70147
12	Output amplifier	4008 108 74670	4822 212 70148
13	Connection board and IF output amplifiers	4008 108 74680	4822 212 70149

Differences for A-version

Unit	*Print number*	*Ordering number*
3	change value of C17 into 33K	
8	4008 108 74700	on request
9	4008 108 74710	on request
10	4008 108 74720	on request
11	4008 108 74730	on request
12	4008 108 74740	on request

Differences for B-version

Unit	*Print number*	*Ordering number*
7	4008 108 74940	on request
8	4008 108 74950	on request
9	4008 108 74960	on request
10	4008 108 74970	on request
11	4008 108 74980	on request
12	4008 108 74990	on request

Diagram number	*Description*	*Value*	*Watt/Volt*	*Ordering number*
R1	Potentiometer + switch	1 kΩ		4822 103 20084
R2	Potentiometer (see also item 19 of mech. parts list)	1 kΩ		4822 101 40024
R3	Potentiometer	1 kΩ		4822 103 20091
R4	Resistor	510 Ω		4822 111 20012
R5	Resistor	1 kΩ		4822 111 20018
LA1	Signal lamp		6 V, 50 mA	4822 134 40003

Unit 1

Diagram number	Description	Value	Watt/Volt	Ordering number
GR5	Rectifier	B30C600		4822 130 50183
GR6	Rectifier	B30C1600		4822 130 50185
C1	Electrolytic capacitor	50 µF	40 V	4822 124 20022
C2-C3	Electrolytic capacitor	250 µF	25 V	4822 124 20043
C4	Electrolytic capacitor	10 µF		4822 124 20353
C5-C6-C7	Electrolytic capacitor	1600 µF	40 V	4822 124 40003
R7	Resistor	2.7 Ω	0.25 W	4822 116 60006
R15	Resistor	620 Ω	0.125 W	4822 110 30102
R19	Resistor	1.2 Ω	0.25 W	4822 116 60004
T1	Mains transformer			4822 146 30239

Unit 3

C1-C2	Capacitor	68 kpF	63 V	4822 121 50175
C3	Electrolytic capacitor	10 µF	16 V	4822 124 20077
C4	Electrolytic capacitor	50 µF	10 V	4822 124 20055
C5	Electrolytic capacitor	200 µF	10 V	4822 124 20072
C6	Capacitor	6.8 kpF	63 V	4822 121 50234
C7	Electrolytic capacitor	200 µF	10 V	4822 124 20072
C8	Electrolytic capacitor	10 µF	16 V	4822 124 20077
C9	Electrolytic capacitor	125 µF	16. V	4822 124 20078
C10	Capacitor	1 µF	250 V	4822 121 40013
C11	Electrolytic capacitor	80 µF	6.4 V	4822 124 20084
C12	Electrolytic capacitor	10 µF	16 V	4822 124 20077
C13	Capacitor	100 pF	500 V	4822 120 20081
C14	Electrolytic capacitor	16 µF	10 V	4822 124 20071
C15	Electrolytic capacitor	10 µF	16 V	4822 124 20077
C16	Capacitor	33 pF	500 V	4822 120 20067
C17	Capacitor (A-version)	33 kpF	63 V	4822 121 50419
C17	Capacitor (B- and E-version)	22 kpF	63 V	4822 121 50287
C18	Electrolytic capacitor	10 µF	16 V	4822 124 20077
C19	Electrolytic capacitor	250 µF	16 V	4822 124 20182
C20	Capacitor	18 pF	500 V	4822 120 20061
R1-R2	Resistor	2.2 kΩ	0.25 W	4822 116 50102
R11	Resistor NTC	4.7 kΩ		4822 116 30013
R13	Resistor	820 Ω	0.125 W	4822 110 30105
R14	Resistor	390. Ω	0.125 W	4822 111 20005
R15	Resistor	68 Ω	0.125 W	4822 110 30076
R16	Resistor NTC	1.3 kΩ		4822 116 30018
R33	Potentiometer	500 Ω	1.5 W	4822 105 20007
R34	Potentiometer	1 kΩ	1.5 W	4822 103 10038
L1	Coil			4822 526 10036

Unit 4

Diagram number	*Description*	*Value*	*Watt/Volt*	*Ordering number*
C1	Electrolytic capacitor	50 µF	40 V	4822 124 20022
C2-C3	Electrolytic capacitor	400 µF	16 V	4822 124 20153
C4	Capacitor	220 pF	500 V	4822 120 20089
C5	Electrolytic capacitor	125 µF	16 V	4822 124 20078
C6-C7	Capacitor	1 µF	100 V	4822 121 40013
C8...C10	Electrolytic capacitor	160 µF	40 V	4822 124 20013
R4	Resistor	510 Ω	0.125 W	4822 111 20012
R7	Resistor	22 kΩ	0.125 W	4822 110 30143
R8	Resistor	2.7 kΩ	0.125 W	4822 110 30118
R20	Resistor	22 kΩ	0.125 W	4822 110 30143
R21-R22	Resistor	390 Ω	0.125 W	4822 111 20005
R23	Potentiometer	100 Ω	1.5 W	4822 103 10035
L1	Coil			4822 526 10036

Unit 5

C1	Electrolytic capacitor	200 µF	10 V	4822 124 20072
C2	Capacitor	22 pF	500 V	4822 120 10063
C3	Electrolytic capacitor	10 µF	16 V	4822 124 20077
C4-C5	Electrolytic capacitor	200 µF	10 V	4822 124 20072
C6	Capacitor	6.8 pF	500 V	4822 120 10049
C7	Electrolytic capacitor	10 µF	16 V	4822 124 20077
C8	Capacitor	47 kpF	63 V	4822 121 50174
C9	Electrolytic capacitor	50 µF	10 V	4822 124 20055
C10	Capacitor	150 pF	500 V	4822 120 10085
C11	Capacitor	6.8 pF	500 V	4822 120 10049
C12	Capacitor	47 kpF	100 V	4822 121 40042
C13	Electrolytic capacitor	10 µF	16 V	4822 124 20077
C14	Electrolytic capacitor	400 µF	16 V	4822 124 20153
C15	Electrolytic capacitor	160 µF	40 V	4822 124 20013
C16	Electrolytic capacitor	16 µF	10 V	4822 124 20071
C17	Electrolytic capacitor	16 µF	16 V	4822 124 20077
C18	Capacitor	1.5 µF	100 V	4822 121 40027
C19	Capacitor	100 pF	500 V	4822 120 10081
C20	Capacitor	1.2 kpF	500 V	4822 121 50188
C21	Capacitor	150 kpF	500 V	4822 121 40031
C22	Electrolytic capacitor	250 µF	16 V	4822 124 20082
C23	Electrolytic capacitor	160 µF	40 V	4822 124 20013
R40	Potentiometer	500 Ω		4822 103 10016
L1-I 7	Coil			4822 526 10036

Unit 6

Diagram number	*Description*	*Value*	*Watt/Volt*	*Ordering number*
C1	Electrolytic capacitor	50 µF	40 V	4822 124 20022
C2	Electrolytic capacitor	32 µF	16 V	4822 124 20097
C3	Capacitor	150 kpF	100 V	4822 121 40035
C5	Capacitor	22 pF	500 V	4822 120 10063
C6	Capacitor	150 pF	500 V	4822 120 30085
C7	Capacitor	100 kpF	1000 V	4822 121 41036
C8	Electrolytic capacitor	50 µF	40 V	4822 124 20022
C9	Electrolytic capacitor	32 µF	16 V	4822 124 20097
C10	Electrolytic capacitor	50 µF	40 V	4822 124 20022
C12	Capacitor	150 kpF	100 V	4822 121 40035
R1-R2	Resistor	6.2 kΩ	0.125 W	4822 116 50207
R6	Resistor	120 Ω	0.125 W	4822 116 50207
R7	Resistor	220 Ω	0.125 W	4822 116 50087
R9-10	Resistor	120 Ω	0.125 W	4822 116 50207
R18	Potentiometer	1 kΩ		4822 100 10037
R25	Resistor	100 Ω	0.125 W	4822 116 50115
R28	Resistor	910 Ω	0.125 W	4822 110 30106
R30	Resistor	100 Ω	0.125 W	4822 116 50115
R33	Resistor	910 Ω	0.125 W	4822 110 30106
R37-40	Resistor	16 kΩ	0.125 W	4822 110 30139
R44	Potentiometer	100 Ω		4822 103 10035
R45	Potentiometer	2 kΩ		4822 103 10034
L1-L3	Coil			4822 526 10036
L5	Coil			4822 158 10057

Unit 7

C1	Capacitor	10 kpF	125 V	4822 120 20134
C2-C3	Capacitor	4.7 kpF	125 V	4822 120 20125
C4	Trimmer	10 pF		4822 125 50022
C5	Capacitor	4.7 kpF	125 V	4822 120 20125
C7	Capacitor	4.7 kpF	125 V	4822 120 20125
C8-C9	Capacitor	10 kpF	125 V	4822 120 20134
C10	Capacitor	4.7 kpF	125 V	4822 120 20125
C11	Capacitor		500 V	4822 120 10065
C12	Capacitor	68 pF	500 V	4822 120 10076
C13...16	Capacitor	4.7 kpF	125 V	4822 120 20125
C17	Capacitor	10 kpF	125 V	4822 120 20134
C18	Capacitor	4.7 kpF	125 V	4822 120 20125
C19	Trimmer	10 pF		4822 125 50022
C20	Capacitor	4.7 kpF	125 V	4822 120 20125
C22	Capacitor	4.7 kpF	125 V	4822 120 20125
C23-25	Capacitor	10 kpF	125 V	4822 120 20134

Diagram number	*Description*	*Value*	*Watt/Volt*	*Ordering number*
R5...R8	Resistor	100 Ω	0.125 W	4822 116 50002
R30...33	Resistor	220 Ω	0.125 W	4822 116 50087
	Resistor	9009 Ω	0.125 W	4822 116 50688
L1-L3	Coil			4822 526 10036
L4	Coil			4822 156 20412
L5-L7	Coil			4822 526 30066
T1-T2	Transformer			4822 158 10215
T3...T5	Transformer			4822 158 10216
T6-T7	Transformer			4822 158 10215
T8-T9	Transformer			4822 158 10217
T10	Transformer			4822 158 10216
X1	Crystal 38.9 MHz (A- and E-version)			4822 242 70125
X1	Crystal 39.5 MHz (B-version)			on request
GR1...GR4	Set of matched diodes			4822 130 30378
R39...R44 GR5...GR8	Complete oven			4822 218 60078

Unit 8

C1-C2	Capacitor	4.7 kpF	125 V	4822 120 20125
C3	Capacitor	15 pF	500 V	4822 120 10058
C4	Capacitor	1 kpF	500 V	4822 120 20107
C5	Capacitor	4.7 kpF	125 V	4822 120 20125
C6	Capacitor	1 kpF	500 V	4822 120 20107
C7	Capacitor	150 pF	500 V	4822 120 20085
C8	Capacitor	68 pF	500 V	4822 120 10076
C9	Capacitor	10 kpF	250 V	4822 121 40088
C10-11	Capacitor	150 kpF	100 V	4822 121 40035
C12	Capacitor	47 pF	500 V	4822 120 20072
C13	Electrolytic capacitor	50 µF	40 V	4822 124 20022
C14	Electrolytic capacitor	160 µF	40 V	4822 124 20013
C15	Capacitor	180 pF	125 V	4822 120 30087
C16	Trimmer	25 pF		4822 125 60031
C17	Electrolytic capacitor	10 µF	16 V	4822 124 20077
C18	Capacitor	470 kpF	100 V	4822 121 40015
C19	Capacitor	1 µF	100 V	4822 121 40013
C20	Capacitor	33 pF	500 V	4822 120 10067
C21	Capacitor	56 pF	500 V	4822 120 10074
C22	Capacitor	4.7 kpF	125 V	4822 120 20125
C23	Capacitor (A-version)	270 pF	125 V	4822 120 60092
C23	Capacitor (B-version)	150 pF	125 V	4822 120 60085
C23	Capacitor (E-version)	150 pF	125 V	4822 120 60085
C25	Capacitor	820 pF	125 V	4822 120 60105

Diagram number	*Description*	*Value*	*Watt/Volt*	*Ordering number*
C26	Capacitor	4.7 kpF	125 V	4822 120 20125
C29	Capacitor	4.7 kpF	125 V	4822 120 20125
C30	Electrolytic capacitor	160 µF	40 V	4822 124 20013
C31	Electrolytic capacitor	250 µF	16 V	4822 124 20082
C32	Capacitor	4.7 kpF	125 V	4822 120 20125
C34	Capacitor	120 pF	250 V	4822 120 30083
C35-36	Capacitor	10 kpF	125 V	4822 120 20134
R26	Resistor	38 kΩ	0.125 W	4822 116 50428
R26	Resistor	21 kΩ	0.125 W	4822 116 50179
R38	Resistor	47 kΩ	0.125 W	4822 116 50108
R40	Resistor	47 kΩ	0.125 W	4822 116 50108
R44	Resistor	750 Ω	0.125 W	4822 110 30104
R61	Resistor	75 Ω	0.125 W	4822 111 20002
R66-67	Potentiometer	1 kΩ		4822 104 10021
L2	Coil			4822 158 10267
L3	Coil			4822 156 10309
L4	Coil			4822 526 10036
X1	Crystal 4.570 MHz (A-version)			on request
X1	Crystal 6.070 MHz (B-version)			on request
X1	Crystal 5.570 MHz (E-version)			4822 242 70126

Unit 9 and 10

In case of doubt concerning the performance of the circuits of units 9 and 10, it is advisable to return the complete PM 5590 to our laboratories for repairs after consultation with the local PHILIPS representative.

Unit 11

C1	Capacitor	8.2 pF	500 V	4822 120 10052
C2	Capacitor	56 pF	500 V	4822 120 10074
C3...C5	Capacitor	10 kpF	125 V	4822 120 20134
C7	Trimmer	3.9 pF		4822 125 60035
C8	Capacitor	68 pF	500 V	4822 120 10076
C9	Capacitor	56 pF	500 V	4822 120 10074
C10	Capacitor	12 pF	500 V	4822 120 11056
C11...13	Capacitor	10 kpF	125 V	4822 120 20134
C15	Trimmer	6 pF		4822 125 60027
C16	Capacitor	68 pF	500 V	4822 120 10076
C17	Capacitor	56 pF	500 V	4822 120 10074
C18	Capacitor	12 pF	500 V	4822 120 11056

Diagram number	*Description*	*Value*	*Watt/Volt*	*Ordering number*
C19...21	Capacitor	10 kpF	125 V	4822 120 20134
C22	Capacitor	4.7 pF	500 V	4822 120 10045
C23...24	Trimmer	6 pF		4822 125 60027
C26	Capacitor	5.6 pF	500 V	4822 120 10047
C27-36	Capacitor	10 kpF	125 V	4822 120 20134
R37	Potentiometer	1 kΩ		4822 101 10059
L1	Coil			4822 156 20413
L2	Coil			4822 156 10311
L3-L4	Coil			4822 156 20414
L5	Coil			4822 156 10312
L6	Coil			4822 156 10311
L7-L8	Coil			4822 156 20414
L9	Coil			4822 156 10312
L10	Coil			4822 156 10313
L11	Coil			4822 156 10348
L12-15	Coil			4822 526 10036
T1	Transformer			4822 158 10216

Unit 12

C1-C2	Capacitor	10 kpF	125 V	4822 120 20134
C3	Capacitor	15 pF		4822 125 60033
C4	Capacitor	10 kpF	125 V	4822 120 20134
C7	Capacitor	10 kpF	125 V	4822 120 20134
C9-10	Capacitor	10 kpF	125 V	4822 120 20134
C11	Capacitor	1.8 pF	500 V	4822 120 10034
C12	Capacitor	10 kpF	125 V	4822 120 20134
C15	Capacitor	10 kpF	125 V	4822 120 20134
C17-18	Capacitor	10 kpF	125 V	4822 120 20134
C19	Capacitor	250 pF	250 V	4822 120 60087
C20	Trimmer	6 pF		4822 125 60027
C21	Capacitor	10 kpF	125 V	4822 120 20134
C22	Capacitor	270 pF	250 V	4822 120 60092
C23...C38	Capacitor	10 kpF	125 V	4822 120 20134
R48	Potentiometer	100 Ω		4822 103 10039
R49	Potentiometer	1 kΩ		4822 101 10059
R50-51	Potentiometer	500 Ω		4822 100 10012
L1-L2	Coil			4822 526 10036
L3	Coil			4822 156 20415
L4	Coil			4822 156 20416
L5-L7	Coil			4822 526 10036
T1-T5	Transformer			4822 158 10216
T6	Transformer			4822 526 10002

Unit 13

Diagram number	*Description*	*Value*	*Watt/Volt*	*Ordering number*
C1	Capacitor	4.7 kpF	125 V	4822 120 20125
C2	Capacitor	33 pF	500 V	4822 120 10067
C3-C4	Capacitor	2.2 kpF	125 V	4822 120 20116
C5	Trimmer	60 pF		4822 125 50011
C7	Capacitor	39 pF	500 V	4822 120 10069
C8	Capacitor	4.7 kpF	125 V	4822 120 20125
C9	Capacitor	2.2 kpF	125 V	4822 120 20116
C10	Capacitor	4.7 kpF	125 V	4822 120 20125
C11	Capacitor	33 pF	500 V	4822 120 10067
C12...C13	Capacitor	2.2 kpF	125 V	4822 120 20116
C14	Trimmer	60 pF		4822 125 50011
C15	Capacitor	39 pF	500 V	4822 120 10069
C16...C22	Capacitor	4.7 kpF	125 V	4822 120 20125
C23	Capacitor	2.2 kpF	125 V	4822 120 20116
C24	Capacitor	10 kpF		4822 120 33134
R16-R18	Potentiometer	500 Ω		4822 100 10012
L1-L3	Coil			4822 526 10036
L4-L5	Coil			4822 156 20417
L6-L7	Coil			4822 156 20418
T1-T2	Transformer			4822 158 10219
T3-T4	Transformer			4822 158 10218

Semiconductors

ADY 26	4822 130 40274	AAY 21	4822 130 30087
ASY 27	4822 130 40269	AAZ 15	4822 130 30229
ASY 29	4822 130 40092	BA 102	4822 130 30272
ASZ 16	4822 130 40279	BAX 16	4822 130 30273
BCY 88	4822 130 30187	BAY 38	4822 130 40256
BCY 89	4822 130 30188	BAY 39	4822 130 30194
2N930	4822 130 40051	BZY 88/C5V6	4822 130 30193
2N2001	4822 130 40187	BZY 88/C6V2	4822 130 30286
2N2297	4822 130 40131	BZY 88/C6V8	4822 130 30079
2N2369	4822 130 40407		
2N2569	4822 130 40424		
2N2894	4822 130 40018		
2N2905	4822 130 40021		
2N3570	4822 130 40451		
TI3027 (selected)	4822 130 40507		

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Send the instrument to the address decided on after consultation with the PHILIPS representative in your country: state reference number(s), if any.

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